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Preparing and Dyeing of Silk Yarns and Cloth

Part I

Nature of the Sericin—Preparation of the Soap Bath—Equipment Employed for Degumming —The Bleaching Process

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THE first operation in the preparation of silk yarns and cloth for dyeing is the boiling off of the silk gum. This is also called degumming or stripping. To many this may seem to be a simple operation; but a number of defects may arise during this process which will appear later in other processes, causing considerable trouble, or appear in the finished goods, making a defective piece or a second.

As most of us know, raw silk is composed of two principal parts—the fibroin, which is the real silk, and the sericin, which is a glue-like substance covering the fibroin, and which in a way acts as a protective agent for the fine silk filaments. Impurities in cultivated raw silk are small, and these vary according to the origin of the silk. In wild silk or the so-called tussah silk the impurities are much larger and cause a great deal of trouble for their complete removal.

The sericin gives the silk a hard, brittle feel and a dull appearance, for the luster and soft, pliable feel do not appear until it is removed. The color varies, according to the origin of the silk, from a light cream or pale yellow shade to a deep yellow or light orange color. The lighter shades are removed much easier in the boiling off of the material than the heavier shades, the latter appearing to have places or spots where the gum seems much harder to remove completely.

There are various ways of removing the sericin or silk glue from the raw fiber, but the one most practically used at the present time is the boiling soap method. The sericin swells in cold water and softens to some degree, and is partly soluble in boiling water. It readily dissolves in hot soap solutions and alkalies; the latter, however, are very detrimental, when concentrated and hot, to the true silk or fibroin; therefore care is necessary in their use. A mild alkali is not so injurious if properly used, and in most cases is necessary in the boiling-off bath. Other chemicals and methods are used for the removal of this gum, but not to a large extent. In time, I think, some other method will be developed which will displace the soap method so generally used to-day. When and how is a question for the future.

The strength of the soap solution and time of immersion depend upon the kind of silk being degummed and the amount of silk glue required to be removed. When treating silk cloth the construction of the goods is also an important consideration. A heavy, tightly woven cloth containing yellow silk or a Georgette of light china silk, chappe or spun silk requires very little soap and sometimes is given only a hot bath containing a small amount of a milk alkali agent, as these silks contain only a small amount of impurities, the gum having already been removed.

Preparation of the Soap Bath

The soap bath usually contains from 1 to 2 ounces of a good grade of neutral soap per gallon. Some prefer to base the amount of soap on their silk, and in this case about 25 per cent on the weight of the material is used. A little mild alkali is beneficial, such as triphosphate of soda, sal soda or similar agents. The amount of alkali used will vary according to the silk and the character of the water. A hard water will require much more. No set formula can be given, as conditions vary in different localities.

A good grade of soap is required, and olive-oil soap is the one most generally used by silk dyers. It should

be made from a good grade of olive oil, one that washes out of the material readily and does not leave any objectionable odor in the cloth or yarn. Other kinds of soap, as tallow, cottonseed oil, olein, cocoanut oil, have been tried and are used, but olive oil seem to be the most popular. The soap should wash out of the goods readily, as traces left in the goods are likely to cause uneven dyeing, especially if dyeing in an acid bath. Some silk cloths have a very objectionable odor when taken out of storage, and this is due in a great many cases to traces of soap left in the goods which have become rancid.

A good grade of water is essential, and softened water of 0 deg. hardness is the best. A hard water will cause considerable damage, even if treated with soda before each wash. A large amount of soap and alkali will be required. There is also the danger of the soap being precipitated out of the bath during the washing operation, causing much trouble for the dyer and finisher, if not damaging the piece.

The length of immersion is usually two or three hours, the silk being worked at certain intervals. Silk yarns are frequently placed in the hot soap solution late in the afternoon and, after working for a short time, immersed in the hot solution over night. In the morning the bath is again heated to the boil, and after working again for a short period the yarn is ready for washing and dyeing. A single boil-off is sufficient for most materials, but some require a double boil.

The boil-off bath can be used several times until it is loaded with gum and other impurities from the fiber.

A small amount of fresh soap and a little more alkali are added for each new lot of material. The fresh baths are used for whites or material which is going to be dyed into light shades, the next time for medium shades, and when the bath appears dark and heavy, with material for dark shades or blacks.

Material that requires double boiling is usually worked for a while in the spent baths and then finished in fresh soap baths.

The amount of glue or sericin removed is usually about 25 per cent, but this may vary a few per cent either way. This produces the commercial boil-off silk which is used in most fabrics. At times only a small per cent is removed and a souple silk is obtained. In this case about 10 per cent of the gum is taken out. This leaves a fiber which is fuller and heavier than the ordinary silk yarn and finds use in weaving certain cloths. In this case a much lower temperature is required, around 80 to 100 deg. Fahr. At times silk is simply soaked in a lukewarm soap bath to remove the waxy material and other impurities, allowing all of the silk glue to remain. This produces the ecru silk which is also used in weaving, these goods being later degummed and dyed in the piece.

Tussah silk or wild silk requires a much stronger and longer process of degumming than the cultivated silks. The raw fiber contains many impurities; the sericin is darker in shade and, as a rule, harder to remove; also the fibroin is colored, a light tan shade being obtained after the boil-off. Acids and alkali do not have the injurious action on tussah silk that they do on ordinary silk, hence a much stronger alkali solution or acid treatment can be given this fiber. Some prefer to treat this silk in a bath of boiling soda ash before the soaping, while others give the material a warm bath of hydrochloric acid, followed by a rinse; then the soda-ash treatment, and finally the soap bath containing some alkali.

After the boil-off the materials should be washed at once in warm water, as there is some silk glue left in the fiber and this washes out much easier while in the softened condition. It hardens when cold, and is then difficult to remove. Another soaping might be necessary; also the soap, which is very abundant, washes out more readily. If this is allowed to dry in the fiber

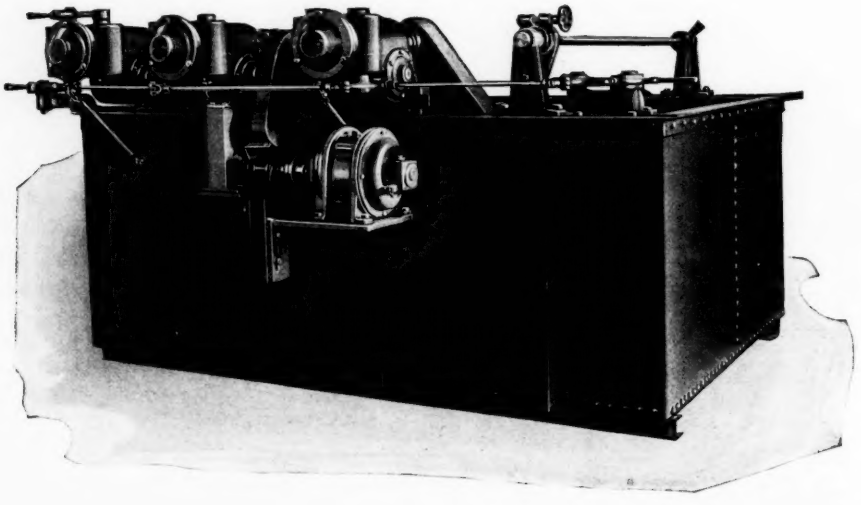

FIG. 1.—*French Boil-Off Machine*

it will be hard to remove completely and is likely to cause dark spots, also causing trouble for the dyer.

Machinery Used for Degumming

There are various machines used for degumming silk skeins. Most of them have porcelain or enameled arms, or in some cases very smooth sticks. The principal thing is to have the skeins immersed in the hot soap solution, with some arrangement whereby they are given a rotary motion.

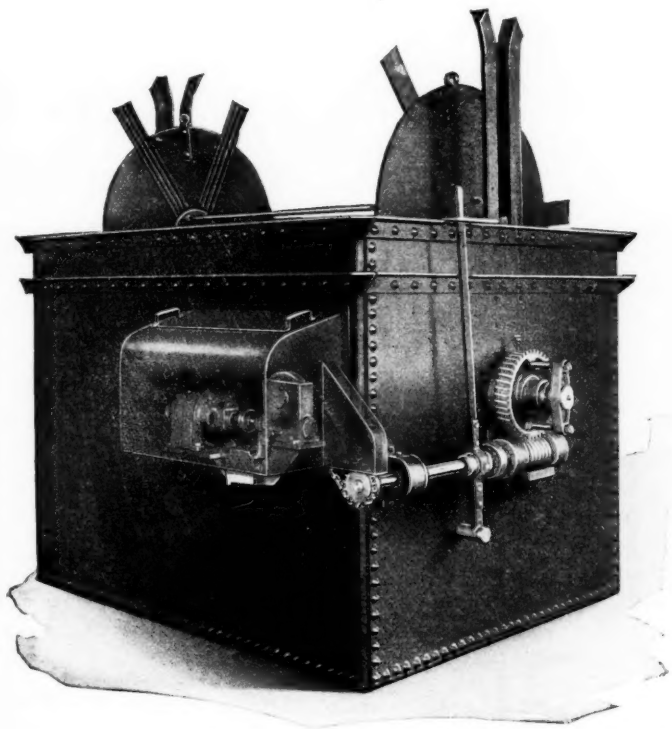

Fig. 2.—*Star Boil-Off or Degumming Machine*

The older method is by use of open rectangular tanks. These are usually made of heavy cyprus wood, and it is advisable to line them with canvas or some metal, as Monel, to prevent the fine silk filaments from catching on the rough wood. The silk yarns are placed on smooth sticks and worked through the boil-off solution, turning at intervals by hand, being allowed to soak at intervals.

Care should be taken when heating these baths, as a too violent circulation of the liquid will cause the threads to tangle, which will make winding difficult. It is a good policy to remove the skeins from the bath and place on racks during the heating of the bath, especially if open steam pipes are used. A temperature of 180 to 200 deg. Fahr. is sufficient, actual boiling being avoided.

Silk pieces are stripped either by hand boxes or machines. Some qualities work very well with machinery, while for others it is better to use the hand method. The boxes used are of a similar character to those used for skeins—they should be deep enough for the goods to hang full length in the soap bath and long so that the sticks can be readily moved through the liquid. The cloth may be rolled up and suspended from sticks in a manner similar to the skeins, turning the cloth in the same way. Another method is to sew string in the selvidge of the cloth, forming a loop, the other end being fastened to the stick. In this manner the entire piece is immersed in the bath. The cloth is allowed to soak in the hot bath, being moved occasionally. The solution should be gently agitated, as too violent circulation will cause defects in the piece.

The French boil-off tank (Fig. 1) is used for heavy goods and union cloth. These are made of sheet iron and contain two large drums in each end of the tank, with small rolls at various heights over which the cloth passes. These pieces are sewed together and wound on one of the drums. It is then threaded over the rollers and fastened to the other drum. When the machine is started, the pieces are pulled through the hot soap bath, winding on the other drum. The motion is reversible, being similar to the jig, and any number of passes may be given. The cloth may be washed in these machines or taken off on rolls and washed in a washer.

Another machine used is the Star boil-off tank (Fig. 2). This is an iron box with a spider arrangement. The silk cloth is wound around aluminum rods in a spiderweb form and held open. The cloth is started at the center of the reel and wound outward in the form of a spiral. The rods are allowed to run down through the folds of the cloth to keep them properly opened for the circulation of the soap solution. The reel is loaded and immersed in the solution, where it rotates slowly during the degumming operation. If the soap bath is not to be used again, the goods are washed on the machine, or they may be removed and washed in a washing machine (Fig. 3).

Bleaching

The majority of the various grades of silks come from the degumming bath, white enough for dyeing most of the shades required. Other varieties have a cream to light yellow cast, and these, along with the tussah silks, require a bleach before they can be dyed into light shades. When dyeing the light pinks, orchid and other pastel shades, a bleach is best with all grades of silk. If goods are to be finished all white, a good bleach, followed by the bluing operation, is required.

There are a large variety of agents used for silk bleaching. Potassium permanganate will produce a fair bleach, but care is required and it is used only to a slight extent. Aqua regia is used to remove the yellow coloring matter left from the gum remaining in souple silk. Sulphur dioxide produced from burning sulphur, sulphurous acid, bisulphite of soda and sulphuric acid are preferred by some. The various grades of hydrosulphites will produce a fair bleach either used alone or in with other agents.

Sodium or hydrogen peroxide is the agent most generally used. While sodium peroxide is preferred by some, a great deal of care is necessary in preparing the bath so as not to allow any free caustic soda to be present, this reagent being detrimental to the silk material especially when bleaching at high temperature. Also it takes a little longer time to prepare the bleach bath than it does with the hydrogen peroxide. Although there is a saving in cost between these two chemicals, all things seem to favor the latter one.

The strength of the bleach bath and the duration of the bleaching operation depend on the shades that the silk material is going to be dyed. In some cases a light or half bleach will be sufficient. This can be accomplished by having a weak solution and allowing the goods to remain the regular time, or by making a regular bleach bath and removing the goods in a shorter period.

The peroxide baths are made up with about 4 gallons of 25 volume hydrogen peroxide to 100 gallons of water. This strength can be varied either way, depending on the method used and the temperature of the bath. It is made slightly alkaline with silicate of soda, tri-phosphate of soda, ammonia or some similar alkaline agent. The material is usually entered cold and brought slowly with steam to the required temperature. If the material is allowed to stay in the bath for some time, as over night, a temperature of 140 to 160 deg. Fahr. is sufficient. If a quicker bleach is required, the bath is heated to 180 deg. Fahr., and the goods are bleached for about two hours. The material should be carefully watched and removed as soon as the proper white is obtained. If they are overbleached the silk will turn yellow and it will be impossible to obtain a good white.

These bleach baths can be used several times by replacing the spent peroxide. It is advisable to titrate with potassium permanganate solution to find the strength of the spent bath. The higher the temperatures are used the less value are the baths for rinse, and in some cases it is as well to start fresh ones. With the lower temperatures there is considerable peroxide remaining, and it is advisable to build them up to be used again, for by their rinse a saving is made in the peroxide required.

After bleaching, the material is washed in plenty of water and is then ready for dyeing. Some bleachers prefer to give their goods a slight sour after the peroxide bleach.

The tubs or machines used for bleaching should be constructed of material on which the bleach agent has no action. The yarns may be bleached in the boil-off boxes, jigs or becks. A concentrated bath produces the best bleaches at the least cost, yet enough room should be allowed so the boxes or machines are not overcrowded. It is essential that the material be properly worked.

(Part II will appear in an early issue.)

SPRING SHOE COLORS ISSUED

Allied shoe and leather associations have selected seven shoe colors for the spring and summer seasons of 1928, in co-operation with the Textile Color Card Association. These colors are: White Jade, a cloudy shade, neither beige nor gray, with a suggestion of mauve cast; Honeybeige, a light beige of honey cast chosen to blend with yellow-toned beiges or soft contrasting shades; third, Rose Blue No. 2, a new version of the popular Rose Blush of the last summer card, offered as a complement to the pinkish beige costume; Marron Glace, a medium brown with light rosy undertones; two grays, Shell Gray and Plaza Gray, a light and a medium, respectively, repeated as the best shades for shoes to harmonize with gray apparel; and Stroller Tan, a golden brown, also repeated from previous cards.

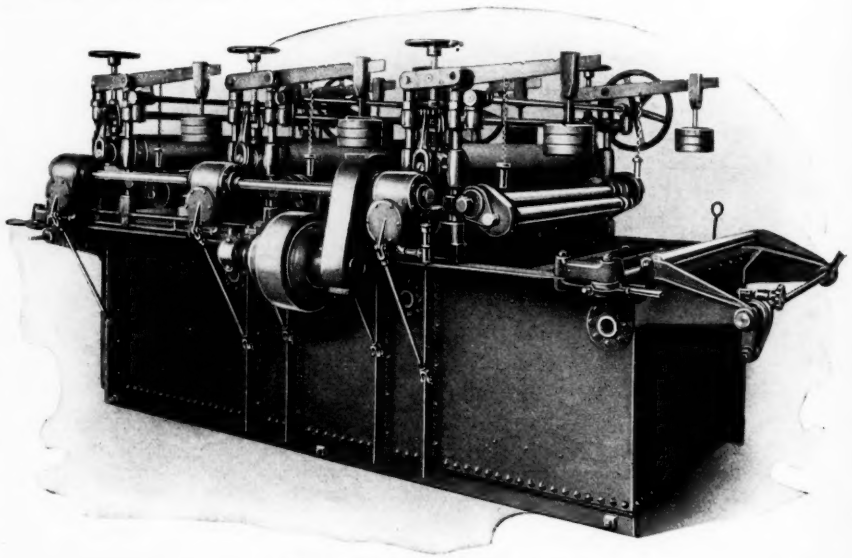

FIG. 3.—*Open Gray Washer*

Testing Methods, Standards and Types for Determining the Fastness Properties of Dyeings on Cotton, Wool and Silk

Part II Dyed Wool

Published by the Fastness Committee of the Section for Chemistry of the Dyestuffs and Textile Industries of the German Chemical Society

(*Third Edition*, 1926, *Verlag Chemie G.M.b.H. Berlin W.* 10, *Corneliusstrasse* 3.)

DYEING is carried out in a 40:1 bath on the weight of the wool to be dyed, using distilled water. The figures in parentheses after the names of the type dyes refer to G. Schultz's Farbstofftabellen, sixth edition, Berlin, 1923.

I.—Fastness to Light

The test is carried out exactly as described under *Dyed Cotton*. In the case of cloth and fabrics for which a very high degree of fastness is demanded, it is recommended that the dyed material should be tested by hanging in the open as well as under glass.

Types

I. Three per cent Indigotin Ia powder (877), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.

II. One and one-half per cent Ponceau RR (82), dyed with addition of 10 per cent Glauber salt and 10 per cent sodium bisulphate for 1 hour at the boil.

III. Two and three-quarter per cent Amaranth (168), dyed as described under II.

IV. Four and one-half per cent Azo Acid Red B (64), dyed as described under II.

V. Five per cent Acid Violet 4 RN (B), dyed with addition of 10 per cent Glauber salt crystals and 3 per cent acetic acid, entering at 40 deg. Cent., bringing to the boil in 20 minutes, boiling gently for one hour, and then exhausting the boiling bath with 2 to 3 per cent sulphuric acid.

VI. Two and one-half per cent Diamine Fast Red F (343), dyed with addition of 10 per cent Glauber salt crystals and 5 per cent ammonium acetate, entering at 40 deg. Cent., bringing to the boil in ½ hour and boiling for ¾ to 1 hour; after boiling for ½ hour, the bath is exhausted with 1 to 3 per cent acetic acid, then cooled to 70 deg. Cent., 1 per cent potassium bichromate added and boiled gently for 20 minutes.

VII. Four per cent Anthraquinone Green GXN (864), dyed as described for Acid Violet 4RN under V.

VIII. Indigo (874) in the same depth as a dyeing of 2.4 per cent Sulphon Cyanine GR extra (257), which has been dyed as described later under 10, V.

OR:

7 per cent Naphthol Green B (4), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 50 deg. Cent., bringing to the boil in 40 minutes and boiling gently for 1 hour.

2.—Fastness to Washing in Presence of White Wool and of White Cotton*

The trial is carried out according to two methods:

(a) The sample, plaited with an equal weight each of white, washed zephyr wool and white, scoured cotton, is treated at 50 deg. Cent. for ¼ hour in a 50:1 bath containing 10 g. Marseilles soap free from caustic alkali and 0.5 g. soda ash per liter of water. It is then pressed out well by hand 5 times, squeezed out well, rinsed and dried.

(b) The plaited sample is treated in the same way at 80 deg. Cent., but after this treatment it is allowed to lie for ¼ hour to cool, and is then treated as above.

A—Fastness to Washing in Presence of Wool.

Standards	*Types*
I. Treated according to (a): The dyed shade is altered considerably; considerable bleeding into the white.	I. Two per cent Orange II (145), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.
III. Treated according to (a): The dyed shade is unaltered or altered only very slightly; no bleeding into the white.	III. Two per cent Patent Blue A (545), dyed with addition of 10 per cent Glauber salt crystals and 3 per cent acetic acid, entering at 40 deg. Cent., bringing to the boil in 20 minutes, and boiling gently for 1 hour; after boiling for ½ hour the bath is exhausted with 3 per cent sulphuric acid.
V. Treated according to (b): The dyed shade is unaltered or altered only very slightly; no bleeding into the white.	V. Seven per cent Palatine Chrome Black 6B (181), dyed with addition of 10 per cent Glauber salt crystals and 3 per cent acetic acid, entering at 60 deg. Cent., bringing to the boil in ¼ hour, and after boiling for ½ hour exhausting the bath by adding gradually 2 per cent sulphuric acid; then cooling to 70 deg. Cent., adding 2.5 per cent potassium bichromate and boiling gently for 40 minutes.

B—Fastness to Washing in Presence of Cotton.

Standards	*Types*
I. Treated according to (a): Considerable bleeding into the white.	I. Two per cent Chrysophenine G (304), dyed with addition of 10 per cent Glauber salt crystals, entering at 40 deg. Cent., bringing to the boil in 20 minutes and boiling gently for one hour; after boiling for ¾ hour, the bath is exhausted with 2 per cent acetic acid.
III. Treated according to (a): No bleeding into the white.	III. Two per cent Patent Blue A (545), dyed as described under 2, (A), III, above.
V. Treated according to (b): No bleeding into the white.	V. Seven per cent Palatine Chrome Black 6B (181), dyed as described under 2, (A), V, above.

3.—Fastness to Water

The sample is plaited with white, scoured cotton, washed zephyr wool and white silk, so that there are two parts of dyed material to one part each of the white materials and each of the latter is in direct contact with the dyed material. The plait is steeped for 12 hours in cold distilled water (about 20 deg. Cent.) using a 40:1 bath, then squeezed out and dried at ordinary temperature.

Standards	*Types*
I. With one treatment the dyed shade is altered or paler; white material is stained.	I. Two per cent Azo Yellow (141), dyed for 1 hour at the boil with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate.
III. With one treatment the shade is unaltered; white material is unstained.	III. Two per cent Patent Blue A (545), dyed as described under 2, (A), III.
V. With three treatments (using fresh water each time) the dyed shade is unaltered; white material is unstained or is stained only very slightly.	V. Seven per cent Palatine Chrome Black 6B (181), dyed as described under 2, (A), V.

4.—Fastness to Rubbing

The dyed material is rubbed vigorously 10 times backwards and forwards with a strip of bleached, unfinished cotton fabric stretched over the forefinger. The distance rubbed amounts to 10 cm. The dyed shade is either fast or not fast.

5.—Fastness to Ironing

Dry ironing is carried out as follows:
The dyed material is pressed for 10 seconds with a hot iron at such a temperature that it just no longer scorches white woolen felt under the same pressure. The alteration of the shade on the ironed portion is determined by comparison with an adjacent unironed portion of the material.

Standards	*Types*
I. The dyed shade is altered considerably and recovers on cooling only gradually or incompletely.	I. Two per cent Fuchsine S (524), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.
III. The dyed shade is altered rather considerably, but soon recovers again on cooling.	III. Two per cent Amaranth (168), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes, and boiling for 1 hour.
V. The dyed shade is unaltered.	V. Two per cent Tartrazine (23), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.

6.—Fastness to Sulphur Stoving

The sample, plaited with washed zephyr wool and white silk, is soaked in a solution of 5 g. of Marseilles soap per liter of water at room temperature, and then wrung out. It is next placed in a vessel filled with sulphur dioxide, by burning an excess of sulphur, left in it for 12 hours, then taken out, rinsed well in cold water, squeezed and dried.

Standards	*Types*
I. The dyed shade is altered rather considerably; while wool is unstained or stained only very slightly.	I. Two per cent Diamine Scarlet B (319), dyed as described under 2, (b), I.
III. The dyed shade is altered slightly; white wool is unstained or stained only very slightly.	III. Two per cent Milling Red G (293), dyed with addition of 10 per cent Glauber's salt crystals and 2 per cent acetic acid, entering at 30 deg. Cent., bringing to the boil in 20-30 minutes, and boiling gently for 1 hour; after boiling for ¾ hour, the bath is exhausted with 3 per cent acetic acid.
V. The dyed shade is unaltered; white wool is unstained or stained only very slightly.	V. Two per cent Palatine Scarlet A (81), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes and boiling for 1 hour.

7.—Fastness to Perspiration

The test is carried out as follows: The dyed sample is placed between white wool and cotton, and steeped in a solution containing 50 g. common salt and 2 c.c. conc. ammonia solution per liter of distilled water at 45 deg. for ¼ hour, then squeezed out and dried.

Standards	*Types*
I. The dyed shade is altered completely.	I. Two per cent Amaranth (168), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes and boiling for 1 hour.
III. The dyed shade is altered considerably.	III. Two per cent Wool Green S (566), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.
V. The dyed shade is unaltered.	V. Two per cent Brilliant Croceine 3B (227), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes, and boiling for 1 hour.

8.—Fastness to Alkali (Street Mud and Dust)

Reagent: A mixture of 10 g. of quicklime and 10 g. of 24 per cent ammonia per liter. The dyed sample is spotted with this, squeezed out, dried at the ordinary temperature without rinsing, and then brushed well.

Standards	*Types*
I. Complete change of the dyed shade.	I. Two per cent Water Blue (539), dyed with addition of 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes, and then boiling for about ¾ hour.
III. Considerable alteration of the dyed shade.	III. Two per cent Amaranth (168), dyed as described under 5, III.
V. The dyed shade is unaltered.	V. Seven per cent Palatine Chrome Black 6B (181), dyed as described under 2, (A), V.

9.—Fastness to an Acid Boil

The sample, plaited with washed zephyr wool, is treated for 1.5 hours in a 70:1 bath containing 2.5 g. sodium bisulphate per liter of distilled water at 90 to 92 deg. Cent., then rinsed and dried.

Standards	*Types*
I. The dyed shade is altered only slightly; white wool is stained.	I. Two per cent Chrome Yellow D (177), dyed with addition of 10 per cent Glauber salt crystals and 3 per cent acetic acid, entering at 60 deg. Cent., bringing to the boil in ¼ hour, and after boiling for ½ hour exhausting the bath by adding 2 per cent of sulphuric acid; then cooling to 70 deg. Cent., adding 1.25 per cent of potassium bichromate and boiling gently for ½ hour.
III. The dyed shade is unaltered; white wool is stained only slightly.	III. Two per cent Diamine Scarlet B (319), dyed as described under 2, (B), I.
V. The dyed shade is unaltered; white wool is unstained or is stained only very slightly.	V. Six per cent Alizarine Black WX extra paste (774), dyed with addition of 10 per cent Glauber salt crystals and 5 per cent acetic acid, entering at 60 deg. Cent., bringing to the boil in 20 minutes, and after boiling for ½ hour, adding 5 per cent of acetic acid. After boiling for 20 minutes longer, cool to 70 deg. Cent., and 2 per cent potassium bichromate and boil gently for 40 minutes.

10.—Fastness to Bleaching

The dyed thin woolen fabric is stitched over with threads of white wool, white cotton and white silk and bleached with hydrogen peroxide. The bleaching bath is prepared with 100 parts of distilled water and 20 parts of 10 to 12 volume hydrogen peroxide, and is made very faintly alkaline by adding a small quantity of ammonia. The bath must remain faintly alkaline during the treatment (test with Congo Red paper). The sample is placed in the bath (40-50:1 on the weight of the sample) at 45 to 50 deg. Cent. and left in the gradually cooling bath for 12 hours. Care must be taken that the sample always remains beneath the surface of the liquid; vigorous stirring is to be avoided. The sample is then rinsed and dried.

Standards	*Types*
I. The dyed shade is unaltered or is altered only very slightly; wool, silk and cotton are stained.	I. Two per cent Azo Yellow (141), dyed as described under 3, I.
II. The dyed shade becomes paler; silk, wool and cotton are stained slightly.	II. Two per cent Patent Blue A (545), dyed as described under 2, (A), III.

III. The dyed shade becomes paler; wool, silk and cotton are unstained.	III. Two per cent Fast Yellow (137), dyed as described for Azo Yellow, under 3, I.
IV. The dyed shade is unaltered or is altered only very slightly; wool is unstained, but silk and cotton are stained somewhat.	IV. Two per cent Chrysophenine G (304), dyed as described under 2, (B), I.
V. The dyed shade is unaltered or is altered only very slightly; wool, cotton and silk are unstained or are stained only very slightly.	V. Two per cent Sulphon Cyanine GR extra (257), dyed with addition of 20 per cent Glauber salt crystals and 5 per cent ammonium acetate, entering at 40 deg. Cent., bringing to 80-90 deg. Cent. in ½ hour and dyeing at this temperature for about ¾ hour.

11.—Fastness to Milling

The test is carried out according to two methods:

(a) Neutral Milling. The sample, plaited with an equal quantity of white wool or cotton, is treated in a milling bath consisting of a 40:1 bath of 20 g. Marseilles soap per liter of distilled water at 30 deg. Cent. The sample is first well milled by hand, then steeped for 2 hours, milled again, washed and dried.

(b) Alkaline Milling. The treatment is carried out as under (a), except that the milling bath contains 20 g. Marseilles soap and 5 g. soda ash per liter of distilled water at 40 deg. Cent.

In presence of White Wool:

Standards	*Types*
I. Treated according to (a): The dyed shade is altered appreciably; white wool is stained considerably.	I. Two per cent Azo Yellow (141), dyed as described under 3, I.
II. Treated according to (a): The dyed shade is altered slightly; white wool is stained slightly.	II. Two per cent Ponceau RR (82), dyed as described for Orange II under 2, (A), I.
III. Treated according to (a): The dyed shade is unaltered, or is altered only very slightly; white wool is unstained.	III. Sulphon Cyanine Black 2B (265), dyed as described under 10, V.
IV. Treated according to (b): The dyed shade is unaltered, or is altered only very slightly; white wool is stained slightly.	IV. Two per cent Chrome Yellow D (177), dyed as described under 9, I.
V. Treated according to (b): The dyed shade is unaltered, or is altered only very slightly; white wool is unstained.	V. Seven per cent Anthracene Chrome Black P extra (185), dyed as described under 2, (A), V.

In presence of White Cotton:

Standards	*Types*
I. Treated according to (a): White cotton is stained considerably.	I. Two per cent Diamine Scarlet B (319), dyed as described under 2, (B), I.
II. Treated according to (a): White cotton is stained slightly.	II. Two per cent Ponceau RR (82), dyed as described for Orange II under 2, (A), I.
III. Treated according to (a): white cotton is unstained.	III. Six per cent Sulphon Cyanine Black 2B (265), dyed as described under 10, V.
IV. Treated according to (b): white cotton is stained slightly.	IV. Five per cent Diamond Black F (275), dyed as described under 2, (A), V, except that it is afterchromed with 1.5 per cent potassium bichromate.
V. Treated according to (b): white cotton is unstained.	V. Seven per cent Diamond Black PV (157), dyed as described under 2, (A), V.

12.—Fastness to Carbonizing

The sample is steeped in sulphuric acid 5 deg. Be. for 1 hour, squeezed so that it retains 100 per cent of moisture and then dried at 80 deg. Cent. for 1 hour. It is then washed with 200 times its weight of distilled water for ¼ hour, squeezed and neutralized in 200 times its weight of a 0.2 per cent soda ash solution for ¼ hour. The neutralization is followed by a thorough washing with water until neutral to litmus paper.

Standards	*Types*
I. The dyed shade is altered considerably.	I. Two per cent Alizarine Red W pdr. (780), dyed on wool mordanted with 3 per cent potassium bichromate and 2.5 per cent tartar at the boil for 1¼ hours; the mordanted wool is dyed in a fresh bath with addition of 2 per cent acetic acid, entering at 30 deg. Cent., bringing to the boil in ½ hour and boiling for 1½ hours.
III. The dyed shade is altered slightly.	III. Two per cent Orange IV (139), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate for 1 hour at the boil.
V. The dyed shade is unaltered or is altered only very slightly.	V. Two per cent Palatine Scarlet A (81), dyed with addition of 10 per cent Glauber salt crystals and 10 per cent sodium bisulphate, entering at 60 deg. Cent., bringing to the boil in 20 minutes and boiling for 1 hour.

13.—Fastness to Potting

The test is carried out according to two methods:

(a) The sample, plaited with an equal quantity of white wool and cotton, is treated in a 70:1 bath of distilled water at 90 deg. Cent. for 2 hours, then washed and dried.

(b) The test is carried out as described under (a), except that 1 g. of Marseilles soap per liter of distilled water is added.

Standards	*Types*
I. Treated according to (a): The dyed shade is altered; white wool or cotton is stained considerably.	I. Two per cent Patent Blue A (545), dyed as described under 2, (A), III.
III. Treated according to (a): The dyed shade is unaltered or is altered only very slightly; white wool and cotton are somewhat stained.	III. Five per cent Diamond Black F (275), dyed as described under 2, (A), V, except that it is after-treated with 1.5 per cent potassium bichromate.
V. Treated according to (b): The dyed shade is unaltered or is altered only very slightly; white wool and cotton are unstained.	V. Seven per cent Alizarine Black WX extra paste (774), dyed as described under 9, V.

14.—Fastness to Dry-Steaming (Decatizing)

The test is carried out according to three methods:

(a) A dry-steaming cylinder is swathed with six layers of the usual material, the material under investigation is next wound firmly and uniformly, or in the case of small patterns a layer of dry-steaming cloth is wound first. It is then swathed further in at least three layers and tied. It is then steamed for 10 minutes from the moment when steam first emerges through the material. It is finally left for 5 minutes and unwound.

(b) The sample is wound on a dry-steaming cylinder and steamed in a closed vessel under 1 atmosphere pressure for 5 minutes.

(c) The treatment is carried out as described under (b), but a pressure of 2.5 atmospheres is used for 10 minutes.

Standards	*Types*
I. Treated according to (a): The dyed shade is altered considerably.	I. Two per cent Thioflavine T (618), dyed in a 40:1 bath at 50 deg. Cent. for ¾ hour.
II. Treated according to (a): The dyed shade is unaltered.	II. Two per cent Sulphon Cyanine GR extra (257), dyed as described under 10, V.
III. Treated according to (b): The dyed shade is altered considerably.	III. Two per cent Sulphon Cyanine GR extra (257), as under II above.
IV. Treated according to (b): The dyed shade is unaltered.	IV. Two per cent Croceine AZ (225), dyed as described under 5, III.
V. Treated according to (c): The dyed shade is unaltered.	V. Nine per cent Naphthol Black 6B (269), dyed with addition of 10 per cent sodium bisulphate, entering at 40° deg. Cent., bringing to the boil in ½ hour, and boiling gently for 1 hour.

15.—Fastness to Sea Water

The sample, plaited with an equal quantity of white wool, is steeped in a 40:1 bath of a cold solution of 30 g. common salt and 6 g. anhydrous calcium chloride per liter of water for 24 hours, and then dried without rinsing.

Standards	*Types*
I. The dyed shade is altered very slightly; white wool is stained considerably.	I. Two per cent Chrysoine (143), dyed as described under 3, I.
III. The dyed shade is unaltered or is altered only very slightly; white wool is stained rather considerably.	III. Two per cent Cyanol extra (546), dyed as described under 2, (A), III.
V. The dyed shade is unaltered; white wool is unstained.	V. Six per cent Sulphon Cyanine Black 2B (265), dyed as described under 10, V.

(Part III, Standards for Dyed Silk, will appear in an early issue.)

Dangers from Static Electricity in the Handling of Solvents*

Danger in Handling Solvents Through Pipe Lines—Preventive Measures—Static from Gases

By A. A. Backhaus

Production Manager, U. S. Industrial Alcohol Company, Baltimore, Md.

[Many serious and occasionally fatal accidents have resulted through the ignition of volatile solvents by static electric sparks in dry-cleansing establishments. All users of such volatile solvents (oftentimes unconsciously) are exposed to similar accidents. We believe that this article will be well worth the attention of those who either regularly or at intervals find it necessary to use such solvents, and it is published with the hopes that it may reduce the hazard from this source.—Editor.]

FRICTIONAL or static electricity has long been known. Rubbing a glass rod with silk, a stick of amber with wool, stroking a cat's back to hear the crackle, shuffling over a carpet to give another person a spark shock, these are all familiar examples of methods whereby static may be produced.

The long time required to ascribe this phenomenon as the probable cause of mysterious fires occuring in

*A paper delivered before the Chemical Section of the National Safety Council at the Annual National Safety Congress held in Chicago, September 26 to 30.

the handling of flammable liquids and gases, is another illustration of mental inertia.

Many years ago Professor Monroe recognized static as a probable cause of so-called spontaneous ignition. (C. E. Monroe—J. Am. Chem. Soc., 21, 317—1899.) It is, however, within the last 15 or 20 years that the subject of dangers from static electricity in industry has received general attention. The advent of the automobile brought with it the handling of gasoline in enormous quantities, by many people and under various conditions. It is not surprising that under these circumstances the dangerous little static spark had many favorable opportunities. The literature references given at the end of this paper contain sufficient proof that static and flammable substances make a dangerous combination.

Fires and explosions constitute the dangers from static in the handling of solvents. Only those substances which are flammable and which have vapor pressure characteristics to produce explosive mixtures with air are dangerous.

Many solvents used in industry are flammable and produce vapors which form explosive mixtures with air, consequently, static is a possible source of danger in handling solvents. In general, static may develop in the handling of solvents as follows:

1—Liquid solvent flowing through pipes or tubing.

2—Liquid solvent passing through a gaseous medium (e.g. air).

3—Solvent vapor issuing from an opening into a gaseous medium (e.g. air).

4—Gas passing through liquid solvent.

The list of conditions thus enumerated is small. However, practically all handling of solvents comes within the range of these operations. From the fact that static fires have been confined to relatively few solvents, it must be concluded that dangerous static arises only under certain limited conditions. If it were possible to define accurately these conditions it would not be difficult to prescribe preventives.

Handling solvents through pipe lines or tubing is universal practice. What danger, if any, is involved?

Electric Potential from Friction in Pipes

It is a well known fact that when some liquids flow rapidly through small pipes electric potential will develop. Dolezalck (Zeitschrift Chem. Ind. 35, 166, 1912), and later, Holde (Berichte d. Deut. Chem. Ges. 47, 3239, 1914), and others, have demonstrated experimentally that electrical charges will develop in this way. Fig. 1 shows apparatus used by Dolezalek. Using gasoline and petroleum ether in a similar apparatus, potentials of 50 to 2,200 volts were obtained by Holde, in copper tubing 2.5 mm. diameter and 95 cm. (about 3 feet) long.

According to Bruno Muller (Chemiker Zeit., Feb. 1, 1923, p. 97-98) a potential of at least 300 volts is required to give a spark strong enough to ignite gasoline.

Assuming that a potential of 300 volts is required to ignite the ordinary solvents used in industry (carbon bisulphide with its very low ignition temperature would undoubtedly ignite more easily), the question as to whether a particular solvent is likely to develop dangerous static while flowing through pipe lines must be related to its electrical conductivity.

To avoid static fires in dry cleaning plants in Germany, M. M. Richter recommended the use of magnesium oleate. It is stated that a concentration of 1/20 per cent of this soap is sufficient to prevent dangerous static in washing wool in gasoline. The soap increases the electrical conductivity sufficiently so that the charge will "drain off." Specific conductance of the gasoline soap solution is of the order 1×10^{-10}.

Bruninghaus (Recherches et Inventions, Vol. 7, 735, 1926) has shown that under certain conditions the presence of metal powder will render gasoline non-electric. He concludes that the substance which causes static inactivity is a substance which increases conductivity.

In view of the importance of electrical conductivity in this study a search was made to find specific conductance data for the common solvents. Unfortunately, data were found for only a few. These are shown in the table:

Specific Conductivity of Liquids (Reciprocal Ahms)

Gasoline[1]	2×10^{-12} (15° C.)
Benzol[2]	2.5×10^{-12}
Methyl Alcohol[3]	0.2×10^{-6}
Ethyl Alcohol[4]	0.103×10^{-6} at 25° C.
Propyl Alcohol (N)[5]	2×10^{-8}
Iso Amyl Alcohol[6]	1.5×10^{-8}
Acetone[7]	0.321×10^{-6} (25° C.)
Ethyl Ether[8]	1×10^{-9} or smaller
Water[9]	0.9×10^{-6} at 18° C.

(1) Chem. Zeit. 148 (1911), p. 1375.
(2) Holde, Ber. **47** (1914), p. 3239.
(3) Jones & Lindsey, Z. Phys. Ch. 56, p. 129.
(4) Walden, Z. Phys. Ch. **54** (1906), p. 128-130.
(5) Keyes & Winninghoff, J. A. C. S. **38** (1916), p. 1178.
(6) Keyes & Winninghoff, J. A. C. S. **38** (1916), p. 1178.
(7) Walden, Z. Phys. Ch. **54** (1906), p. 128-130.
(8) Holde, Ber. **47** (1914), p. 3239.
(9) Kendall, J. A. C. S. **38** (1916), p. 2460.

An examination of the table shows that many solvents are fairly good conductors. Such solvents when flowing through pipe lines are safe statically. With liquids whose specific conductivity is low, dangerous accumulation of static may be avoided by using pipe lines which are good conductors and well grounded.

What has been said thus far applies to the handling of solvents in liquid form and confined in pipe lines.

(*Continued on page* 660)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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NOMINEES FOR OFFICERS FOR 1928

As Chosen by Nominating Committee

President: Dr. E. H. Killheffer.
Vice-President: W. S. Williams.
Vice-President: Dr. Joseph F. X. Harold.
Treasurer: Winthrop C. Durfee.
Secretary: W. E. Hadley.
Councilor for Three Years: B. S. Phetteplace and R. F. Culver.

In accordance with the terms of the Constitution, counter nominations for any office, signed by at least ten members, may be filed with the Secretary not later than November 1. Such counter nominations would then appear on the regular ballot.

Respectfully submitted,
W. E. HADLEY, *Secretary.*

SEPTEMBER MEETING OF THE NEW YORK SECTION

The first meeting of the New York Section of the American Association of Textile Chemists and Colorists for the 1927-1928 season was held on Friday evening, September 23, at the Machinery Club, in New York City, Samuel L. Hayes presiding.

When the minutes of the previous meeting had been approved as read, the Chairman made an announcement relative to new business.

Chairman Hayes—Is there any old business to come before this meeting?

If not, under the head of new business, I should like to announce the following committees covering this year's work:

The Committee in Charge of the Annual Meeting, which I presume we all know is to be held in New York this year, is as follows: Dr. Elvin H. Killheffer, chairman, A. P. Howes, Herbert Grandage; the Membership Committee: Daniel P. Knowland, chairman, Louis F. Bume, William E. Mitchell, Robert R. Sleeper, W. C. Hall; the Program Committee: Henry F. Herrmann, chairman, Dr. Joseph F. X. Harold, Philip H. Stott.

Dr. Killheffer, of the Committee on Annual Meeting, could not be with us to-night, and there is very little to report on that committee at the present time, but at the next meeting there will be a complete report of the activities and program for the annual meeting. About all I can tell you is that headquarters will be at the Hotel Pennsylvania.

Mr. Howes—I might say that we have two very good dinner speakers who, I am sure, will be appreciated by every one. One is Mr. Daniels, who spoke to us in the South, and also Mr. Frank Alva Parsons, who spoke to us four or five years ago in New York and whom everyone liked so much.

Chairman Hayes—The Program Committee is the key committee of the organization, and I would be very glad to hear from Mr. Herrmann for a few minutes if he has anything he would like to say in that connection.

Mr. Herrmann—There is really very little I have to

say about the work of the Program Committee. You gentlemen who have perused the program which probably lured you here to-night realize that some preparation was necessary; somebody had to think up these things, somebody had to interest speakers who are worth while, and we cannot depend entirely on outsiders to come to address us. There is lots of very, very fine material that we can draw on right from our own ranks, and my object in speaking now is to extend a very cordial invitation to everybody here. The average person is a little reluctant to get up on his feet and say anything. Possibly he is a little diffident about speaking of his own work. He may sometimes feel that he is not quite at liberty to disclose this or to disclose that.

On the other hand, if everybody felt that way, you might as well get a Victrola here and just play a few records. Somebody will have to speak. We have to span the year. We are trying to arrange topics and provide programs which will touch everyone, touch every field of the textile chemical and dyeing arts.

We propose to get up a circular letter—I hate them myself, but I suppose that is what we shall have to do—naming certain subjects, and we propose to send those to the members. We should deeply appreciate getting a reply from every member, even those members who don't feel that they care to speak themselves, suggesting subjects for discussion. We want you to attend meetings, where you may not perhaps be the leader, prepared to discuss things, with a little thought on the subject, with a few questions, and make these meetings of great value.

We don't like to have the meetings entirely social affairs, although we are by no means overlooking that phase. After all, it is the salt that you get out of these things that brings you back. If it is a matter of pure sociability, almost all of us have other places where we can go for it. If it is just to have a good time or a good dinner or see pleasant faces and hear good stories, almost everybody has places he can go to for that, and he doesn't have to travel for twenty-five or fifty miles to do it.

So we should like to have something real and genuine for you, and we can only have it if everybody will pitch in. I think the very fact that you belong to the Society would testify to the fact that you are interested in this work, and being a worker among us, each one of you has some message for the others. Thank you! (Applause.)

Chairman Hayes—I am glad I called on Mr. Herrmann to make that speech instead of myself. There is little I can add except to say that I hope you will support Mr. Herrmann and the other officers in this matter of programs.

It has been my pleasure to be a member of the Program Committee for the past two years, and sometimes it was not a pleasure, but if the three hundred and some odd members which Mr. Knowland has secured for us here in New York will support Mr. Herrmann, at the end of the year I feel that we can look back upon a series of programs of which we can well be proud.

The only other report I know of is the report of the Treasurer, Mr. Sokolinski.

Mr. Sokolinski—We have $30.09 in the treasury, with all bills paid.

. . . The report of the Treasurer was accepted.

Chairman Hayes—I don't know what the forthcoming months will bring in the way of bills. Is it time to call upon the national organization or is it a little early for that?

Mr. Sokolinski—We have only had $100 this year.

Chairman Hayes—How much are we due to have?

Mr. Sokolinski—One dollar per member.

Chairman Hayes—I think then a motion will be in order that the Secretary be instructed to call upon the national organization for $100, that much and more being due us. Will anyone make that motion?

. . . The motion was made, seconded, and carried.

Chairman Hayes—I have no doubt the Secretary will attend to that to-morrow. Is there any further new business to come before us before we start on our program proper?

I think the notice of the meeting proves that our Program Committee has started off at high speed. It is not necessary to make any introduction of our first speaker. I presume there are few in the room who do not know Dr. Oscar R. Flynn, of the Waldrich Bleachery, and I am glad to call on him for his paper on "Bleaching Cotton Piece Goods from the Mill Man's Standpoint."

[Due to a delay in securing the edited report of Dr. Flynn's address it could not be included in these Proceedings. It will appear in the next issue with the full report of the discussion that followed.]

Chairman Hayes—Are there any further questions for Dr. Flynn? If not, he rather left us at the point of the goods entering into the chlorine, or, as we say in the bleach house, into the chemic, and I shall call on Mr. W. E. Phillips, of the Mathieson Alkali Works, to continue on the subject of "Liquid Chlorine in Textile Bleaching." (Applause.)

Liquid Chlorine in Textile Bleaching

By W. E. Phillips

Mathieson Alkali Works, Inc., Charlotte, N. C.

One of the most interesting growths in the history of science saw the light of day in 1774 when Scheele discovered the element, chlorine. At first chlorine proved to be a stubborn chemical "giant" due to its physical and chemical properties, baffling many of the keenest minds of those pioneer days.

As you know, bleaching textiles in those days consisted of what was known as "grassing" or "crofting" and was the result of boiling out, washing and exposing the material to the action of the air and sunlight. The first few experiments with chlorine proved very unsatisfactory until Tennant, of Glasgow, obtained patents for the manufacture of bleaching powder in 1799. Naturally the mistakes of those days were rectified and the chemist has been doing much work of an excellent character on this subject during and since the war so that it is not surprising to find that modern and up-to-date bleacheries are demanding a liquid chlorine bleach in the place of the old bleaching powder.

This replacement of liquid chlorine for bleaching powder was not unexpected, was in fact logical and orderly, yet it is surprising that the transition took so long in coming about. To the manufacturer this change was encouraged even at enormous expenses incurred in "junking" of obsolete machinery, rebuilding plants, purchasing of cylinder and tank car equipment, etc.

A faint idea of the vastness of this expense is shown by the increased consumption of liquid chlorine in North America:

In 1918 there was a consumption of 7,900 tons.

In 1924 there was a consumption of 33,000 tons.

In 1926 there was a consumption of 65,000 tons.

Of this consumption 50 per cent was taken by the paper industry, 16 per cent by sanitation, 15 per cent by the textile industry, while the remaining 19 per cent was consumed by all other users.

New vs. Old Bleaching Methods

To the bleachers the advantages of liquid chlorine over bleaching powder were clearly and definitely set forth and as enthusiastically accepted. We recall in the Southern States that there were barely a dozen mills using liquid chlorine in 1920; to-day the conditions are reversed and there are but two or three mills in the South using bleaching powder. Of course, there are some few mills in other parts of the country that have been slow in changing over, others that have found it feasible to retain the old methods for the present, but the mills of to-day, building bleacheries, are equipping them to use liquid chlorine.

Some of the many advantages found in using liquid chlorine instead of bleaching powder follow:

1. The unstable character of bleaching powder especially in warm weather and the difficulties in storing it for any length of time without deterioration and loss.

2. The non-uniformity of bleaching powder, especially low test.

3. The bulkiness of the packages requiring large storage space and the freight charges on the lime that plays no direct part in bleaching.

4. The disagreeable features in using bleaching powder such as accompany the preparation of the chemic, the washing and removal of the sludge, the loss of chlorine "brought down" with the lime, and the particles of lime dust settling on finished goods in the bleachery.

5. The harshness of feel on the bleached material.

6. The slowness of the bleach due to the possible coating of fibers of the calcium carbonate, which is precipitated by the action of carbon dioxide of the air on the calcium hypochlorite.

7. The tendering of goods caused by the neglect in removing the lime salts, the selection of the wrong type of sour, and the frequency in which free alkali (calcium hydrate) forms when a calcium hypochlorite solution is diluted to low concentration. Calcium hypochlorite, after having all of the free lime present carbonated, will then form an appreciable amount of hypochlorous acid and free chlorine will further result in the formation of oxycellulose.

Preparation of Sodium Hypochlorite

One of the most marked advantages in using liquid chlorine is the method in preparing the sodium hypochlorite solution and the knowledge that the resulting chemic contains a definite quantity of available chlorine. And the point of vantage has been found to be directly dependent on the selection of a soluble alkaline salt of definite character. Caustic soda and soda ash have been adopted as the most suitable, each possessing definite values in the preparation of sodium hyypochlorite.

When caustic soda is employed in the preparation of sodium hypochlorite, the following reaction occurs:

$$2NaOH + Cl_2 \rightarrow NaOCl + NaCl + H_2O,$$

and the amount of caustic needed is accordingly 80 parts caustic soda to 71 parts of chlorine; but it is found necessary to have this solution slightly alkaline, otherwise hypochlorous acid would form, which would make this solution quite unstable. In practice, 100 pounds of chlorine usually require 120 pounds of caustic soda dissolved in 400 gallons of water.

There is a rise of temperature caused by the heat of reaction corresponding to 0.5 deg. Fahr. for each gram of chlorine per liter; and the final temperature of the solution should not exceed 90 deg. Fahr., otherwise there would be a corresponding loss of available chlorine caused by the formation of sodium hypochlorates from sodium hypochlorites:

$$3NaOCl \text{ heat} \rightarrow 2NaCl + NaClO_3$$

Sodium hypochlorite prepared with caustic soda is recommended when the chemic is to be held over for three or four days or longer, when the atmospheric tempera-

ture points to summer months, or in other words, when a more stable bleach is needed.

Sodium hypochlorite when prepared with soda ash causes no increase in temperature and finds the soda ash rapidly absorbing the gas. The reaction following:

$$Na_2CO_3 + Cl_2 + H_2O \rightarrow NaCl + NaHCO_3 + HOCl,$$

would lead one to believe that 70 parts of chlorine would require 106 parts soda ash; but a large excess of soda ash is necessary because the bicarbonate of soda so formed, reacts with the chlorine as follows:

$$NaHCO_3 + Cl_2 + H_2O \rightarrow NaCl + H_2CO_3 + HOCl,$$

and the hypochlorous acid thus formed is probably "soured" by the carbonic acid liberating oxygen and free hydrochloric acid.

Hence, it is necessary to stabilize this solution which is accomplished by having the ratio of soda ash to chlorine 3½ parts to one, so that the final reaction accordingly is:

$$2Na_2CO_3 + Cl_2 + H_2O \rightarrow NaCl + NaOCl + 2NaHCO_3.$$

In practice there is a formula recommended employing 350 pounds of ash to 100 pounds of chlorine to 400 gallons of water. This solution will contain 30 grams available chlorine per liter, corresponding to a Twaddle of 18½ deg., and will naturally be further diluted before being used in the chemic cistern. Sodium hypochlorite prepared with soda ash is endorsed by those who make up a "batch" daily and who require quick and active bleach. It is more unstable than the sodium hypochlorite prepared with caustic soda, due undoubtedly to the large amount of bicarbonate of soda present.

The Boil-Out Important

We see how very essential it is that we know the accurate sodium oxide content of our alkalies in the preparation of sodium hypochlorite, and this naturally resulted in the national adoption of straight soda ash and caustic soda.

Fundamentally the bleaching of textiles will always be the same and consists of the whitening of the cellulose of the fiber *after* the impurities have been removed. Yet this factor is quite often overlooked by some of to-day's bleachers who only partially remove the impurities and who attempt the oxidation before a thorough "bottom" is obtained. The boil-out is one of the keynotes to successful bleaching, and too much time cannot be given to the selection of the alkalies used in this operation.

I shall not attempt to discuss the matter of "souring" as Mr. Eldridge will do so far more ably. I would like to say, however, that the tendering of material is quite often caused by an incomplete removal of the sour; as well as an incomplete removal of the chemic with chlorine stains forming later. A test at all stages of souring is recommended, such tests to be very simple but rigidly enforced. It is surprising to discover that many bleacheries have no available thermometers and hydrometers for use in testing both the sour and the chemic, and these tests are undoubtedly most important to proper bleaching. A check of free alkali with a solution of phenolphthalein, a test for free chlorine with a solution of potassium iodide, designated hours for determining the temperature and available chlorine in the chemic, and finally, a closer analysis of all chemicals entering the bleachery will prove of material aid in turning out a better bleach more economically.

Chairman Hayes—Are there any questions to ask Mr. Phillips? Hearing no questions, we shall pass on to the next paper, "Electro-Chlorination for Textile Bleaching." I take great pleasure in calling on Clarence W. Marsh, of the Marsh Electro-Chlorination Company. (Applause.)

Electro-Chlorination for Textile Bleaching

By Clarence W. Marsh

President, Marsh Electro-Chlorination Company

When Dr. Harold asked me to talk, I felt some diffidence about addressing textile chemists, because I am not a chemist; but I shall speak to you from an engineering point of view, having had some experience in the commercial manufacture of these chemicals and also more recently in developing and putting on the market equipment for factories, mills, and even the very smallest plants, for making electrolytic products.

In the first place, this subject is of interest to bleacheries because electrolysis of brine produces two of the principal products they use. Furthermore, mills can combine the two products directly and make and use soda bleach as they want it.

Now, textile people are interested only in electrolytic cells in so far as it will help them make larger profits or produce better manufacturing processes. Some general facts may be helpful to show that under ordinary conditions there is a large potential value in making your own products electrolytically at the mill. The principal factor, as you all know, is power, but under the ordinary conditions of power at mills it is very plain that sufficient margin for a considerable profit remains.

Stating it briefly, the cost of manufacture of electrolytic chlorine and caustic soda liquor, which can be used directly in making soda bleach or other products, is the same as the manufacture of finished chlorine (liquid chlorine, or bleach) and soda at the factory. This includes capital cost for the electrolytic equip-

ment at the mill and for the capital cost of the electrolytic and finishing cost at the factory.

The capital cost for the very smallest electrolytic equipment for mills would be somewhat larger but not very much more than the capital cost for the electrolytic and finishing equipment at the large factories.

For larger consumers making their own the capital cost would be very much less. No expenditure is necessary, as Mr. Philips has pointed out, to cover the heavy expense for finishing the electrolytic chlorine to liquid or as bleach and the caustic cell liquor to solid caustic or concentrated caustic liquor shipped in tank cars.

Comparative Costs of Making Chlorine in the Mill

Perhaps the best way to compare costs is to be guided by the prices of chlorine and the equivalent caustic soda produced with it. This may be 8 cents or 9 cents or 10 cents, more or less, depending on the consumer's demand. The smaller consumers must pay more, therefore the margin to work on is greater for the small consumer even though his costs are greater. For the larger consumer, prices will be less and the margin less, but the amount that he makes will be greater and therefore the profits will loom larger.

Take a combined price of around 9 cents; not that it is particularly accurate—it may be 8½, 9, 10 or 11 cents—that is, one pound of chlorine as liquid or as bleach and one and one-seventh pounds of caustic soda. The cost of manufacturing, including everything, at the plant will be around 6 cents, more or less. The cost for even the smallest consumer making his own will be a little under that, with power at about half a cent. As the power goes up, of course the cost goes up; but remember, we have a margin of 3 cents left between the price of 9 cents and the cost of 6 cents. That covers the profits, which must be large enough during these days of high costs to cover administration, sales and other costs not included in the cost of production.

Then, on top of that, the consumer has to pay transportation, which adds to his margin for profit. Then, to this is added the cost of handling and changing the finished commercial form to the lower price form, or the form in which he would use it.

In general, the capital cost of the larger consumer making his own will be considerably less than at the factory, and therefore the profits will run about twice or three times what they do to the manufacturer of finished products. For the smaller consumer, on account of the higher prices that he has to pay, the margin will run a little less, from 15 to 30 per cent on the capital investment. In other words, the capital invested is considerably less for the larger consumer making his own than it is for the manufacturer of finished commercial products.

Electrolytic Equipment

The next phase of the subject would be the equipment required. To those of you who do not understand electrolytic processes we can briefly state that it simply consists of a number of units supplied with saturated salt solution and charged with a low voltage direct current. These units are operated in series and the current is transformed either through motor generators or rotary converters from A. C. current, limiting voltage to 300 volts for safety, which means, with cells averaging perhaps 4 volts, about 75 cells in series, or, if the voltage of cells is less, more cells.

There are two types of cells equally efficient—the mercury cells, which produce a caustic free from salt and stronger than the diaphragm cells, and diaphragm cells, which produce a caustic containing an equivalent amount of salt, which can be recovered.

The consumer making his own chemicals pays a higher price for salt, and it will pay for the recovery if quantity used is large enough.

All cells are equipped with the same kind of anodes, usually graphite, and the cathodes are usually steel or grids or perforated metal. The chlorine is formed at the anode and is taken away, approaching 100 per cent, as the efficiency of the cell is high and the pipe lines of the cells are tight. All cells can be operated at equal efficiency if equal attention is given to them. Some cells are harder to renew and others have to be renewed frequently.

Costs are well known; for instance, graphite running about 1 pound per 100 pounds of chlorine; the floor space required, about 80 square feet per 1,000 amperes, down to about 8. In recent years they have been reducing the floor space required by reducing the size of the equipment. They have improved the design; in fact, the art has made great advances, as in all arts. People know more about it; it is no longer a mystery; and it would seem that the profits would be well worth while that come from eliminating waste motions, especially where labor and materials are as high as they are to-day. By analysis we can show that sufficient margin for profit is there for many consumers to make their own.

So far as using electrolytic products is concerned, they are in their simplest form and can be combined directly for manufacture of the soda bleach. The soda bleach is pure because there has been no finishing, no

heavy metal salts present to accelerate breakdown of bleaches.

The main feature is that equipment is there to make bleach in the quantity and as you want it, fresh, and with no expense of storage, no elements of waiting for deliveries, no hazards due to high-pressure cylinders or tanks of liquid chlorine, no deterioration of commercial bleach.

All in all, it seems to be awaiting the time when the textile manufacturers and the bleacheries have the money to spare, as the profits of 15 to even 60 per cent on the capital are very attractive to any mill.

All textile mills and bleacheries have plenty of use for their money in increasing the efficiency of their power and heating plants, which is one direct step to the next step of using the higher pressures of steam as power. Many mills do this where they have given us figures of four-tenths of a cent per kilowatt-hour as the cost of power which is available and which they don't use. (Applause.)

Chairman Hayes—I don't know that it is a fair or a sensible question, but I should like to ask Mr. Marsh whether he could give us any idea as to the returns on the capital investment to a plant, say, which would require 50 to 100 pounds of liquid chlorine a day. In other words, is that too small a unit to be considered?

Mr. Marsh—No. The initial costs are pretty high when you get down to such a small unit, because of the necessity for some profit to the people who furnish the equipment. In the larger plants you would build your own under the supervision of engineering advice.

A plant of 100 pounds of electrolytic chlorine daily complete would utilize very little floor space and would run to $3,000 or $4,000, the return on the investment depending on the power. If your power is 2 cents a kilowatt-hour, as high as that, the return would be not more than about 10 per cent; but as the power went down to ½ cent, there would be about 30 per cent return.

Remember that salt is a big element to the small consumer, too. In fact, that is a very costly part of it, because, as a rule, they wouldn't recover the salt. In a thousand-pound plant your return would run from probably 25 to 35 per cent. For a ton a day it would run up to 50 per cent. Your initial costs per pound will start at about the same cost as for manufacturing finished products on the larger scale, which is about 10 cents per pound or more; that is, per pound of chlorine manufactured per year. For a larger consumer it would be about half what it costs the large manufacturer; the investment would be about half. You see, therefore, that the profits of commercial manufacture are added to by the saving of transporting and, furthermore, handling and converting back again to the original form at the mill would add considerable to the profits to the mill.

Chairman Hayes—Are there any further questions for Mr. Marsh? If not, we will pass on to what is really the final chemical action in bleaching. After your souring, after your acid treatment of your sulphuroxide treatment, or whatever antichlor you use, you have your washing; but the final chemical treatment is that of the chemical used to neutralize the excess chlorine.

We will call upon John R. Eldridge, of the Virginia Smelting Company, who will talk on "Sulphur Dioxide as an Antichlor." (Applause.)

SO_2 as Antichlor and Final Sour

By John R. Eldridge
The Virginia Smelting Company

In the bleaching of cotton goods there is generally used one of two compounds, sodium hypochlorite (NaOcl) or calcium hypochlorite ($Ca(Ocl)_2$). In either case, it is the general practice to have the hypochlorite treatment followed by an antichlor or final sour.

Goods coming from the bleaching solution will contain varying amounts of hypochlorite, and ordinarily some alkalinity, and it is the purpose of the sour to neutralize the chlorine and the small amount of alkalinity that is contained in the goods.

Sours Generally Used

The sours mostly used are sulphuric and hydrochloric acid. Sodium bisulphite ($NaHSO_3$) and sodium thiosulphate ($Na_2S_2O_3$) are used to some extent, and a number of mills use both bisulphite of soda and sulphuric acid.

The use of sulphur dioxide as an antichlor and sour is becoming more popular, and we find the number of mills using SO_2 growing all the time, probably due to the fact that liquefied SO_2 is now obtainable in steel cylinders, which makes a convenient method of application possible.

Using sulphuric acid as a sour, the residual bleach in cloth will react with the sulphuric to form sodium sulphate and hydrochlorous acid. Hydrochloric acid reacts similarly to form sodium chloride and hypochlorous acid.

This method of souring with mineral acid, as you know, does not neutralize the chlorine or make it harmless, but merely puts it in a more active state, and, of course, the test for chlorine will show up after these sours.

Advantages of SO_2

On the other hand, sulphurous acid (which is a water solution of SO_2) will attack the residual bleach in the fibers of the goods and completely neutralize the free

chlorine. Looking at this reaction we find that with sodium hypochlorite and sulphurous acid, the resulting compounds are sodium chloride and sulphuric acid.

As you can readily see, the chlorine immediately combines with sodium to form common salt, at the same time, of course, sulphuric acid is formed which may appear to insert an element of danger. But when you consider the very small concentration of sulphuric acid and the fact that this acid comes into use as an added sour, taking care of some of the alkalinity contained in the goods, you can readily see that there is no danger.

In practice, there are a number of mills that use SO_2 as an antichlor in the sour pit, and the building up of objectionable compounds in the sour pit is not noted. Bisulphite and other sulphites are used to good advantage, for they are similar in action to SO_2, but with bisulphite, for example, you don't get as strong an acid radical to neutralize the alkalinity, and you are actually putting in useless salts that merely add to the concentration of the sour pit.

Cost of SO_2 as an Antichlor

Each mill has its washing problems, and it will be of interest to you to know that because of the very positive action of SO_2 as a sour, a number of mills have found it practical and safe to cut down on their washings, in some cases actually eliminating one wash either before or after the SO_2 sour.

Of course, a great deal depends on conditions at each individual mill, but I can say with safety that SO_2 is a great deal cheaper than any of the mineral acids generally used, costing about three cents per 1,000 pounds of goods. In addition, there is the added safety factor against tendering, and the probable elimination of excess washes, etc.

Application of SO_2

In continuous rope bleach, a cylinder of SO_2 is placed alongside of the sour pit and a hose or lead pipe is extended from this cylinder valve to the bottom of the pit. The cylinder valve should be opened and SO_2 introduced to the sour pit until the solution contains about .025 per cent SO_2, then the goods can be started, passing through the sour pit, the strength of the solution being kept between .025 per cent and .05 per cent SO_2, by cracking the valve when the strength is lowered, and shutting off the valve when it gets strong. There is no danger from using stronger solutions of SO_2, but in solutions over .05 per cent there is a tendency to give off SO_2 to an extent that may be objectionable to the men about the bleach house.

The strength may be determined with tenth normal iodine solution, but in a number of the mills they merely take the odor as indication; that is, if you can detect any odor of SO_2 in the solution, you may be sure that the solution is sufficiently strong.

Where the solution is pumped over the goods, a somewhat stronger solution may be made up and pumped over the cloth, or the same strength .025 per cent made up and SO_2 added to it as is necessary to maintain strength at or near .025 per cent.

In either case, the goods are in good condition to finish, and a very light wash is sufficient to make sure there is no objectionable compound on the goods.

For matter of emphasis, I am going briefly to list the advantages of using SO_2:

(1) Elimination of tendering. SO_2 acts instantaneously to neutralize the bleach, and any sulphurous acid left on goods volatilizes before the goods dry.
(2) Minimizing the inert salts to be washed out.
(3) Goods softer when finished.
(4) Simplifies washing.
(5) Ease of handling.

Chairman Hayes—Are there any questions for Mr. Eldridge? Is there any further business to come before the Section to-night? If not, I shall call for a rising vote of thanks to the four speakers who have been here to show we have all enjoyed listening to them.

. . . A rising vote of thanks was given the speakers, after which the meeting adjourned at 9.40 o'clock.

NORTHERN NEW ENGLAND SECTION

The first meeting of the Northern New England Section of the American Association of Textile Chemists and Colorists for the season 1927-28 will be held on Saturday, October 22, at the Engineers' Club, Boston, Mass.

Mr. Hall, engineer for the De Laval Separator Company, will be the principal speaker, and his subject will be announced later. Members of the section should kindly reserve this date.

Applicants for Membership

Active Membership

Fisher, Nelson A., overseer of dyeing, Louisville Woolen Mills, Louisville, Ky. Sponsors: W. B. Carter and E. J. Zillessen.

Harkins, Arthur T., colorist, Newport Chemical Works, Inc., Passaic, N. J. Sponsors: E. H. Killheffer and C. F. Schaumann.

Kritchevsky, Dr. W., chemical director, 1401 West Jackson Boulevard, Chicago, Ill. Sponsors: Moses H. Goldman and J. J. Sokolinski.

Jacoby, Areli H., treasurer Deltex Company, 516 Atlantic Avenue, Boston, Mass. Sponsors: Edward S. Chapin and Walter C. Durfee.

Pharr, William Neal, superintendent Hartsell Mills Company, Concord, N. C. Sponsors: H. B. Constable and C. H. Stone.

Prisley, Frederic A., chemist, Wanskuck Mills, Providence, R. I. Sponsors: Alexander Morrison and P. F. Ripley.

Sims, Walter, textile engineer, Greenville Finishing Company, Greenville, R. I. Sponsors: A. N. Dana and John Hutton.

Suttenfield, T. W., superintendent Cloverdale Dye Works, High Point, S. C. Sponsors: T. D. Meisenheimer and W. H. Barnhardt.

Junior Membership

Bouchard, George H., chemist and dyer, Hayward Hosiery Company, Ipswich, Mass. Sponsors: J. M. Washburn and H. F. Finlay.

Tickle, Herbert M., dyer and bleacher, American Thread Company, Fall River, Mass. Sponsors: James Worton and C. Nelson Alderman.

Changes of Address

Bell, Edward B., Overseer of Dyeing, Lowell Dye Works, Lowell, Mass. Mail address: 64 Humphrey Street, Lowell, Mass.

Buddy, Gridley, 461 West Manhattan Boulevard, Toledo, Ohio.

Cole, Rotheus P., 1490 Franklin Avenue, Detroit, Mich.

Endriss, P. A., 6161 Haverford, Philadelphia, Pa.

Forsdale, Oscar H., 2240 Eastbrook Drive, Toledo, Ohio.

Griffin, William B., Masson Dyeing Company, Paterson, N. J.

Gutekunst, William R., 411 Broadway, Paterson, N. J.

Hartley, John, 302 South College Street, Charlotte, N. C.

Laurin, Sven, 40 Lundberg Street, Lowell, Mass.

Martin, H. W., care of General Dyestuff Corporation, 230 Fifth Avenue, New York City.

Mungall, T., Pell City, Ala.

Roun, Carl D., Scottwood Apartment, 2518 Monroe Street, Toledo, Ohio.

Shane, Jr., Nat. C., care of Canadian Celanese, Ltd., Drummondville, P. Q., Canada.

Whattam, T. W., 20 Clinton, Newton, N. J.

Resignation

Brown, G. Arthur, 45 Waverly Street, Newton, Mass.

Seventh Annual Meeting

of the American Association of Textile Chemists and Colorists

will be held in

New York

at the

Hotel Pennsylvania

December 2nd and 3rd

Technical Session,
Saturday Morning and Afternoon.
Annual Banquet Saturday Evening.

Informal Smoker and
Open Forum
Friday evening.

Technical Program and other details will be announced later—but

Check the dates now!

AMERICAN
DYESTUFF REPORTER
Sample Swatch Quarterly
Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.
LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
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CLAYTON HOAGLAND
Managing Editor
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October 17, 1927

"THOSE EVENTFUL YEARS": 1917-1927

The "Reporter" Celebrates Its Tenth Anniversary

WITH this issue the AMERICAN DYESTUFF REPORTER turns the corner of its first decade. Ten years have passed into history since the first issue appeared; years so chalked over in memory with impressions that to trace distinctly the big, significant swings and movements which marked the growth of the domestic dye industry is an involved and arduous task. And what eventful years! . . . eventful for the REPORTER because they were eventful for the American dyestuff industry and for consumers of American dyes. And because this decade has been the formative period of an essential American industry, it has been a period of great import not alone to that industry but to the entire country.

It was on October 8, 1917, that the Black Publishing Company, of New York, issued the initial number of a harmless-looking little weekly paper "published in the interests of consumers and manufacturers of dyestuffs, colors and allied chemicals." "It aims to establish a closer association—a better understanding—among all elements in this newest of American industries," it announced. "Its mission is worthy—with your help it can succeed." A. P. Howes, the founder of the REPORTER, and its present publisher, was then vice-president of the Black Publishing Company. Myron D. Reeser, its present advertising manager, was managing editor of the new weekly.

The need for such an organ had been determined by inquiries among dye manufacturers and consumers. The lively response to the letter of inquiry had implied a most encouraging interest in the infant dye industry, in its protection and development. But there was much to be done if the industry was to survive after the war, and it was recognition of this fact that prompted the REPORTER to assure its readers that "its mission was worthy." Throughout its history the paper has been actuated by this belief, and to it likes to attribute a large measure of its success.

Can we say that a dyestuff industry existed ten years ago? Rather, the seed or nucleus of an industry existed. The materials were there but they had to be organized, shaped, developed, perfected and guarded. On one hand were factors and conditions so propitious to the growth of the industry that the mirror of its future reflected only sunshine; but to counteract these were obstacles and dangers that threw long shadows across the road ahead.

The raw materials of dyestuff manufacture were abundant. Consumers clamored for something—anything—to replace the supply of foreign colors shut out by the war blockade. But trained technical men were few, and even the best knew little more than the fundamentals of dye manufacture. Chemical equipment had not been fully developed in this country. Research on any scale was almost negligible, and very little technical data had been compiled. Those who had boldly ventured to set up plants were bending under the burden of their invested capital and harrassed by the thought of what their fate would be if a sudden ending of hostilities were to expose them to the blast of foreign competition. Thus stood the situation when the REPORTER came on the stage.

The little weekly was not content with asserting that its mission was worthy; it set out at once to prove it. The means it employed proved also that the paper was a fighter from the word "Go!" There were great issues to be thrashed out and it turned to the fray with a spirit that soon won a host of loyal and zealous friends—as well as a brood of foes.

There were, we repeat, great issues to settle and great causes that needed such a champion. The dye producers were scattered, unorganized, without unity of purpose or principle; so that what existed then as an industry could have been easily disrupted by the skilled propagandists of the day and blasted into fragments under the fire of foreign competition. If prevailing trade evils were to be cleaned up, if technical research was to be pursued efficiently, if consumers and public were to be dye-educated, if foreign markets were to be secured, and finally if adequate protection was to be fought for, the industry had first to be united, and to this end the REPORTER worked by strongly endorsing the national association of chemical industries that was proposed in the latter months of 1917.

This project, as older readers will recall, crystallized into definite form in a memorable convention of American Dyestuff Manufacturers in New York in January, 1918, at which plans for forming a Dyestuff Association were announced and such salient issues as the standardization of colors, the education of merchants and the public, and effective tariff protection were volubly discussed. This Dyestuff Association was the parent of the later organized American Dyes Institute, which in turn became the Synthetic Organic Chemical Manufacturers' Association of to-day.

The future course of the industry hung upon the re-

sults of that convention. In lending its support to the campaign for a Dyestuff Association the REPORTER made its first effort to prove the worthiness of its mission, and likes to believe that in this crisis it actually was of some service in the movement for a united industry. For long after the manufacturers had declared a willingness to co-operate in improving trade conditions and crusading for protection, the little weekly continued to stress the need for concerted action and a closer understanding, not only among manufacturers, but between the industry and the consumers. The soundness of this attitude was revealed later, first when a committee of color makers and consumers was formed to advise the War Trade Board of imports, and some few years later when the American Association of Textile Chemists and Colorists was organized.

Meanwhile, before the scheme of a co-operative industry bore fruit, other issues had crowded forward and were demanding attention in the columns of the REPORTER. The trade of those days swarmed with "gyps" and grafters who, like all similar evils, could be discouraged more effectively by publicity than by any other means. Publicity, too, for the annual chemical expositions and the Tariff Commission's Dye Census, served more notably in those days than now to draw the attention of the world outside to the country's key industry and the need for its development and maintenance.

Events of far-reaching effect, such as the establishment of the Chemical Foundation in 1919, were interpreted by the REPORTER in terms of "steps forward" toward that goal of independence for which the industry was constantly striving. Technical research and the week by week advance of the color range were live topics. The expansion of our dye export markets was something always to be encouraged, and the weekly REPORTER devoted one issue every month to a discussion of foreign trade opportunities.

In the three years following the close of the war the dye industry moved ahead rapidly and took on girth as well as stature. Du Pont entered the field as a dye producer in 1918. More manufacturers were offering a genuine dyestuff service. Each new annual census disclosed the previous year's progress in statistics that told a story of remarkable growth. In an editorial published in February, 1919, the REPORTER avowed: "Given a chance to continue its development unmolested and to mature the plans already formed, the industry is certain to amaze the pessimists."

Not only was the dye industry growing in a material way; its prestige also grew and was sedulously fostered by every available means; for the manufacturers believed that success in their struggle for protection depended more on a well-earned national prestige than on any influence they might be able to wield in Washington. Textile mills looked upon domestic colors with increasing favor, despite numerous complaints over fastness and uniformity. The REPORTER of that era was continually recommending a program of publicity. "The dye industry must be made a news item" was reiterated in its pages time and again. And because there was another brand of news—propaganda—which was not called for but was contributed gratis by antagonistic agencies, and which had to be exposed and denounced, the REPORTER slept with an eye always open.

The recovery of Europe's dye industries, meanwhile, had been watched from this quarter with some apprehension as well as interest. France and England were carefully coddling their war-born dye plants, while Germany planned a spectacular comeback. Already her maneuvers were hampering our trade in the Far East.

Stirred by their uneasiness over this looming foreign menace, no less than by an innate desire for complete independence, American dye manufacturers became more vociferous in their crusade for tariff protection. For the industry realized that in this it faced the most urgent and vital issue in its entire history. The REPORTER published opinions of both manufacturers and consumers on the tariff question. A Licensing Commission was proposed to replace the Dyes Section of the War Industries Board and with this proposal as an opening wedge the battle was begun in earnest, in the early months of 1919. The British licensing scheme was held up as a pattern of what we needed here, and when finally the Congressional Ways and Means Committee met to discuss a licensing plan and an amendment to the pending dye tariff, REPORTER readers were given the full story of the hearings. All elements in the industry were persistently urged to express their desire for protection by means of letters and petitions to Congress. Action on the tariff was demanded at once; no delay would be tolerated. What optimists we were in 1919!

When the Longworth bill was launched in Washington the worthiness of the little weekly's mission was once more demonstrated. In its pages week by week the fight for protection was carried forward. It labored to keep up the morale of the industry, to compel action on the Longworth measures and to expose and repel every movement of the opposition. Any passages that might be quoted here from editorials of the day would give but a bare hint of the true situation as the case for protection dragged slowly through two, three, four heart-rending years. England, with enviable good sense, had passed its Dye Import Regulation Act. The specter of another German invasion of our dye markets loomed always in the background while our protective measures were pending; and constant vigilance had to be maintained against the machinations of those who charged the creation of an American dye monopoly and cried for investigations.

Harding was lauded when finally he assured the industry that it would get protection, and some temporary relief came with the passage of the Dye and Chemical Control Act in May, 1921. The idea of a licensing scheme had become unpopular and the Longworth bill was forever "in committee." But hope glowed anew with the creation of the Fordney Tariff in the latter months of 1921, only to be dimmed again when the Dye Embargo

clause was removed from that measure after weeks of bitter debate in the House.

Before the battle for protection was won, the little weekly REPORTER came to the end of its career, in the Christmas season of 1921. More than a year before—in August, 1920, to be exact—a Monthly Technical Supplement had been issued, to fill the need for "a publication devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto." Although much excellent technical material on dye application had been published in the weekly, the paper was not primarily a technical journal. But even while engaged in championing the rights of dye producer and consumer, it had sensed the growing interest among mill men in the technology of dyeing, and with the Technical Section had endeavored to develop that interest. In form the new section was almost identical to the present journal. Wholly separated in purpose and scope from the weekly it aimed to "fulfill all the obligations resting upon a technical journal of the first rank." To the end that this aim might be conscientiously pursued, Prof. L. A. Olney was appointed directing editor, an office which he still so ably fills. Its editorial policy coincided with that of the weekly insofar as it dealt with the fight for tariff protection and other issues pertinent to the welfare of the dye industry; but its principal feature was the high quality of its technical articles. So, in the winter of 1921, the weekly was incorporated with this Monthly Technical Section to form the bi-weekly journal that you are now reading.

But we are ahead of our story. Another worthy mission—worthier by far, we feel, than any it had yet striven to accomplish—had called for the REPORTER's earnest support. A few months before the passing of the weekly edition a series of editorials had appeared in the Technical Supplement proposing the formation of a technical association of the textile chemical industry. We quote from one:

> The benefits to be derived from a technical association . . . are obvious. It would make possible the freer interchange of ideas and could provide for the dissemination of knowledge useful to all. It might reasonably be expected to develop better acquaintanceship and morale among technical men, to stimulate the spirit of research, and to emphasize right educational methods in industry—all of which are results worth going after. The REPORTER believes that the time is now ripe for the organization of a technical association . . . and that the industry would gain immeasurably by the presence of such a body within its ranks.

Views of representative textile chemists and dyers favoring the formation of a technical association were later published, and early in September, 1921, a small group of the leaders of the coloring profession, at the invitation of Prof. L. A. Olney, editor of the REPORTER, met at the Engineers' Club in Boston and decided to send out an invitation, signed by those present, to attend a meeting to be held at the Chemists' Club, New York City, during the week of the Chemical Exposition, with a view to discussing the formation of "an association of textile chemists and colorists."

This meeting, attended by about sixty individuals, was duly held and it was unanimously voted to proceed with the organization of such an association. Professor Olney was elected chairman of the meeting, and was authorized to appoint various committees on organization, etc., which should report at an inaugural meeting to be held at the Engineers' Club, Boston, on November 3, 1921.

When this meeting convened "The American Association of Textile Chemists and Colorists" was formally organized with 140 charter members present. Professor Olney was elected president, a constitution was adopted, and the AMERICAN DYESTUFF REPORTER was designated as the official organ of the Association.

The relationship thus established in 1921 has continued to this time, and the REPORTER feels that had it failed in every other undertaking, the successful promotion of the A. A. T. C. C. would be ample reward for its ten years of activity in the dyestuff field.

How the membership of the Association has multiplied during the past six years: how its local sections have been increased to the number of seven, and what these sections have achieved in the dissemination of technical knowledge among their members; what the committees have accomplished in establishing fastness tests and standards—all these matters are familiar to our readers and are merely recalled here that this summary may be complete.

While the latter years have not been quite so exciting for the dyestuff industry—nor for the REPORTER—as in the heyday of the battling weekly, there has been no lack of momentous issues to thrash out and causes to champion. Full tariff protection had not yet been secured up to the time of the weekly's passing, remember; and before the enactment of the Fordney-McCumber tariff in 1922 there were interminable delays, much tiresome Senatorial heckling and repeated time extensions of the licensing plan.

The smoke had scarcely cleared over this hoary battleground before another decisive conflict was impending, with the Chemical Foundation and the United States Government as principals. Although charges of conspiracy and illegal transaction were entered against the Foundation as early as September, 1923, and although it was firmly believed that the Government's case did not have a leg to support it, vigilance could not be relaxed in the dye industry until the final conclusive victory in the fall of last year.

Who will say there are not fully as many issues facing dye manufacturers and consumers to-day as in the chaotic days of a decade ago? The dye industry

has attained its goal of independence, but with what cost to its well-being its leaders know. To-day, ten years after it united to combat trade evils and contend for protection, it must solve anew the problem of organizing its forces to safeguard its welfare; though it is an economic rather than a political co-operation that is needed now.

Dye consumers face equally important problems. The textile industry must determine upon some course of concerted action in the conduct of its technical research, and must be always concerned with the improvement of its processes and the increase of its technical knowledge.

Because there remains so much to do the REPORTER still believes that "its mission is worthy" and that "with your help it can succeed." With the current issue it enters upon the first year of a second decade, which it hopes will be in every way as eventful and as successful as the first. It takes this occasion to express its gratitude to an ever-broadening circle of friends for their loyalty and support in the past, and to voice the hope it may continue to deserve their good-will in the future. C. H.

READ IT AGAIN

THAT invaluable records of the dye industry's progress, the Tariff Commission's annual Census of Dyes and Other Synthetic Organic Chemicals, has just been issued for the year 1926.

A preliminary report, summarizing this latest edition by the Dye Census, appeared in these columns last April. It presented the important general statistics of dye and coal-tar chemical production, exports, imports, labor conditions, and a survey of the international dye trade. The complete report now published may therefore look to many readers like "old stuff." But read it—study it—and read it again. You will find it the most instructive treatise on economic conditions in your industry that has ever been compiled. We repeat—read it again.

DYE AND CHEMICAL TRADES ORGANIZED TO AID RED CROSS

"Even so late as eight years ago we regarded the Red Cross as the signal of mercy and protection from the disaster of war; but to-day it has become a new symbol, the banner of mercy and skilled protection from the disaster of flood, fire and storm." In these words Herbert Hoover characterizes the work of the Red Cross, in whose annual roll call, which opens on Armistice Day, the entire dyestuffs and chemical field in New York City will be intensively covered by a specially organized section functioning under the chairmanship of Herman A. Metz, president of H. A. Metz & Co. and the General Dyestuff Corporation.

A specialized Dyestuffs group will be included in the section already active under the personal direction of Mr. Metz, which also will include a Manufacturing Chemists group, Oils, Paints and Varnish, Heavy Chemicals, and Essential Oils.

The vast volunteer organization of the city organized to secure the maximum response throughout the metropolis to the annual membership effort will number representatives of every phase of New York's industrial, mercantile and professional life. Following the program which has functioned with conspicuous success in previous years, the huge volunteer alignment will be based on the plan of widespread committee groups to carry the roll call message into every branch of trade and industry, and by the opening of the roll call it is estimated that approximately 200 such groups will be in action, each under the leadership of an outstanding figure in the field to be covered by the individual group.

In covering the dyestuffs and chemical fields, Mr. Metz, who served with notable results in the roll call endeavor last year, will reorganize to assist him the same committee of prominent leaders in the various lines who co-operated with him then. In outlining his plans for the forthcoming appeal he is anticipating even more generous support for the roll call this fall and, with his committee of sub-chairmen, will aim at a unanimous enrollment of the personnel throughout the entire field.

Included in the metropolitan activities of the Red Cross, for whose adequate maintenance the annual membership invitation is extended to every resident of the city, are the disaster relief and the public health program, under which thousands of surgical dressings are supplied each year to local hospitals, and which also covers nursing service, first aid and work in home hygiene and care of the sick.

Disabled ex-service men and their dependents are also a large factor in the Red Cross program, and activities on their behalf include legal assistance, money loans and medical attention.

WASHING THE AIR OF LAUNDRIES

Laundries have found that the worst enemy of clean linen is the dirty air which so often blows through the windows of their washrooms, states a recent bulletin issued by the Modern Science Institute of Toledo. They are therefore washing the air by filtering it and otherwise treating it with large ventilating fans properly located about the building.

The laundries have found, too, that they must not only protect goods from the effects of poor air conditiions, but that they must control air in all seasons for the health and comfort of employees. Air is systematically circulated in summer to cool employees who work over machines which develop high temperatures. The laws of several States, such as New

York, require not only that hoods be placed over flat ironers or manglers, but that the heat and moisture under these hoods be exhausted by special fans to the outside. Other fans bring in a fresh supply of air as vapors and steam are exhausted.

One large laundry in Little Falls, N. J., recently spent more than $200,000 for equipment, which included four air washers, a series of ventilating fans and unit heaters to handle a particularly difficult air condition. Many laundries which are located along railroad tracks or near big industrial plants are forced to condition their air to avoid serious economic loss and damage from dirt in the air. Many small laundries have solved their problem by the simple use of unit heaters which heat in the winter and cause a cooling effect in the summer, besides helping to provide good ventilatiion.

ON THE FRENCH TARIFF SITUATION

The following announcement was issued last week by the Synthetic Organic Chemical Manufacturers' Association relative to a letter sent by the association to President Coolidge in reference to the recent tariff contention between the United States and France:

Because of the possibility that the Administration may deem it necessary to invoke against France the retaliatory measures provided in the tariff act, and because some consumers of synthetic organic chemicals may fear that such an action would embarrass them in some way, we have advised the President as follows:

THE PRESIDENT, October 1, 1927.
The White House,
Washington, D. C.

Sir: The French Government has seen fit to discriminate against importations from the United States, and in view of the fact that the Administration may decide it necessary to avail itself of the authority provided under Section 317 of the present tariff act, to impose an additional duty of 50 per cent, or even to declare an absolute embargo against imports from any country discriminating against the United States, we offer the following facts for consideration:

The synthetic organic chemical industry of the United States, of which this association represents a substantial portion, has developed to the point where the most drastic provisions invoked against the products of the similar industry of France would work no hardship on the American consumers of such products. The volume and variety of synthetic organic chemicals of the United States could easily be increased to care for all our domestic requirements; and while we hope some other method may be found, there need be no fear that the imposition of even the most drastic provisions of the tariff act will create any serious difficulties for the American consumers.

Respectfully yours,

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS' ASSOCIATION OF THE UNITED STATES.
(Signed) August Merz, President.

CORRESPONDENCE

Editor, AMERICAN DYESTUFF REPORTER:

In connection with your editorial, "Ever Dye a Horse?" in the September 19 issue of the REPORTER the following quotation may be of interest: It is taken from Pellew's "Dyes and Dyeing" (McBride & Co., New York, 1918), and refers, of course, to the manganese brown which craft dyers sometimes use on cotton.

Very truly yours,
W. C. HOLMES.

"In at least one instance, however, it has been used on animal fibers with considerable success. During the critical part of the Boer War, it was at one time necessary for England to put as many of her troops as possible—especially her mounted troops—into the field. Among others the Scots Greys, distinguished at Waterloo and made famous in many other bloody campaigns as a fine old fighting regiment, were ordered to the front. There is a tradition, dating back over two hundred years, that the horses of this regiment must all be either white or gray in color. Some heaven-sent genius at the Horse Guards—the English War Department—hinted quite forcibly to the authorities that to send out a cavalry regiment on white horses to face the Boer sharpshooters, was rather a dangerous experiment. The authorities, therefore, consulted a well-known dyeing chemist. He advised them to send down, on the troopship, some kegs of permanganate; and to instruct the officers and men to sponge each horse with a weak solution of the salt every day at "Stables." This was done, and, in consequence, long before reaching Cape Town, the skin and hair of every horse was thoroughly colored a soft, quiet shade of brown."

EXPORTS OF DYEING AND TANNING EXTRACTS FOR AUGUST

The Bureau of Foreign and Domestic Commerce of the United States Department of Commerce has issued the following statistics on exports of American dyeing and tanning extracts for the month of August.

Of logwood extract 159,908 pounds, valued at $16,185, were exported; of other dye extracts, 77,028 pounds, with a value of $7,977; of dyeing and tanning materials crude, 74 tons, valued at $3,720; of chestnut, 276,890 pounds, valued at $8,859; of other tanning extracts both vegetable and chemical, 2,851,043 pounds, with an invoice value of $134,657.

DANGERS FROM STATIC ELECTRICITY IN HANDLING SOLVENTS

(*Continued from page* 646)

Under this condition there is little danger from static with conducting solvents.

The real danger starts where the pipe line ends. Here the fireworks may begin. If the line ends in the air and the stream of liquid falls, a new condition is encountered. Under these conditions high static potentials may develop with any liquid, even water. Possibilities of static from this cause are very thoroughly covered in a paper given by Naylor & Ramsey before the Petroleum Section of the National Safety Council in 1923. There is no simple grounding method of taking care of and rendering harmless static produced by liquid spray. The simple safety measure in this case is to avoid static by avoiding the spray, which can be done by discharging the liquid at the bottom of the receiving vessel or tank.

If conditions are such that liquid spray cannot be avoided, the only safety measure is to condition the air, so that the electric charges on the droplets will dissipate themselves. Ionizing the air for example with ultra-violet light or X-rays, or humidifying the air will render such static harmless.

There seems to be uncertainty as to what is a safe relative humidity. In Wm. W. Milne's very interesting paper on "Fire Hazards in Churns and Spreader Rooms," read before the Rubber Section at the Twelfth Safety Congress, a relative humidity of 40 to 45 per cent is said to give a "safe" atmosphere.

The exact relation between humidity and static dangers seems not to have been covered experimentally. It is the intention of the author to investigate this question.

Static from Gases

The third general method encountered in handling solvents covers solvents in vapor phase, i. e., in gaseous forms. Some very interesting work has been done in connection with the study of static produced by gases. The use of hydrogen gas in air navigation involves dangers and accidents from static ignition of hydrogen gas. Articles by Nusselt and by Pothmann appearing in 1922 in the Zeitschrift des Vereines Deutsche Igenieure are very interesting. The following is translated from Nusselt's article:

"Although hydrogen is used extensively in industry, an unusual and undesirable property of this gas has become evident in connection with its use in airships. In the hangar the gas bags are filled with hydrogen gas delivered through pipe line from the gas works. The distributing pipe is usually laid in a trench in the hangar and connected with the supply main. The distributing pipe has a number of branch outlets to which hose connections are made for filling the individual gas bags of the airship with hydrogen. It was frequently observed that hydrogen gas, blowing out through leaks, would ignite spontaneously. This occurrence had been observed by Count Zeppelin in Friedrichshafen and in his first airship hangar pails of water and wet blankets were kept on hand to extinguish such fires. It was further observed that on opening valves on compressed hydrogen cylinders, flames would issue. Naturally, these spontaneous fires resulted in loss of airships. In one case, after a newly built ship had just arrived in a new hangar, replenishing of gas bags was in progress when suddenly flames shot out of the water drain of the filling header and destroyed ship and hangar. In another case, two marine airships were in one hangar. A sailor had just finished filling a gas bag in one of the ships. After detaching the connecting hose from the gas bag, he laid the open end on the floor in the hangar, contrary to orders. The valve on the main pipe was not tight, so that some hydrogen bled out of the open end of the hose. Suddenly flames shot out of the open end of the hose and both ships as well as hangar were destroyed by fire. As these cases increased during the war the Reichsmarineamt created a commission to study the spontaneous ignition of hydrogen."

The work done by Nusselt in connection with the problem is summed up in the following conclusion which he draws:

"The results of my experiments may be summed up briefly as follows: In spite of many attempts it was impossible to cause spontaneous ignition of pure and clean hydrogen from a leak in a line. Spontaneous ignition can take place only when dust particles flow out with the hydrogen. Because of the friction during discharges, the dust particles become electrically charged. Sparks from these charged particles lead to the ignition of the gas."

The results published by Pothmann covering his study of static with gases, particularly hydrogen, also show that clean gas is non-electric. However, when a liquid or solid is present in the jet of issuing gas static charges will accumulate.

The steam jet, utilized in the old Armstrong hydro-electric machine, will develop static of high voltage. The invisible portion of the jet at the opening from which the steam issues is not charged. It is only after condensation takes place that static charges develop, presumably due to friction of the droplets through the gaseous medium.

There are many anhydrous liquids which will not generate dangerous static flowing through pipes; likewise, gases in motion through the air will not develop static unless solid or liquid particles are present.

Very little practical information is available covering the fourth condition listed at the beginning of this paper. The use of air for agitation is a common practice in chemical industry. Air is extensively used for agitating alcohol to render the contents of a tank

uniform. To my knowledge, no accident has ever resulted from this practice, due probably to the fact that alcohol is, relatively speaking, a good conductor.

It is doubtful if this practice is a safe one in the case of solvents having low conductivity.

A scientific investigation of this problem would be very helpful.

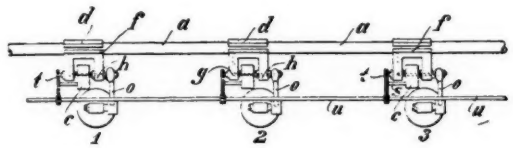
RECENT PATENTS

Method of and Means for Manufacturing Artificial Silk

(1,641,588; September 10, 1927)

Martin Holken, Jr., Barmen, Germany.

In an apparatus for the manufacture of artificial silk thread by the stretch-spinning method, a supply conduit containing the cuprammonium cellulose solution, a plurality of spinnarettes each having a plurality of apertures of at least 0.8 mm., a rotary controller between the supply conduit and each spinnarette, each controller governing



the flow of solution from the conduit to the spinnarette, communicating therewith and operative for feeding from the conduit to the spinnarette for expression through the spinnarette apertures a fixed volume of the solution per unit of time constantly proportionate for a rate of flow through the spinnarette apertures for continually producing filaments of aggregate dimensions when combined to form a thread of continuously predetermined and unvarying diameter, and also operative for protecting such volume of solution from pressure variations of the source, means for subjecting the filaments expressed by each spinnarette to stretch reduction, a source of power for driving the controllers, and toothed gearing between said source of power and the controllers for immutably operating said controllers invariably at the same rate of speed.

Method for the Production of Anhydrous Sodium Bisulphite

(1,638,492; August 2)

Napoleon Arthur Laury, Rockville Centre, N. Y.

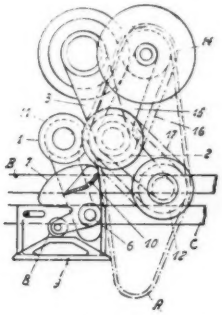
The method of producing commercial anhydrous sodium bisulphite, which consists in subjecting commercial sodium carbonate to the action of substantially pure sulphur dioxide in the presence of a trace of moisture.

Machine for Teating Yarns in Hanks with Liquid

(1,639,438; August 16)

Jacques Schlumpf, Oberwinterthur, Switzerland.

In a machine for continuously dyeing, washing and otherwise similarly treating yarns in hanks, pairs of rollers upon and between which the hanks are suspended, of which rollers one of a pair is positively

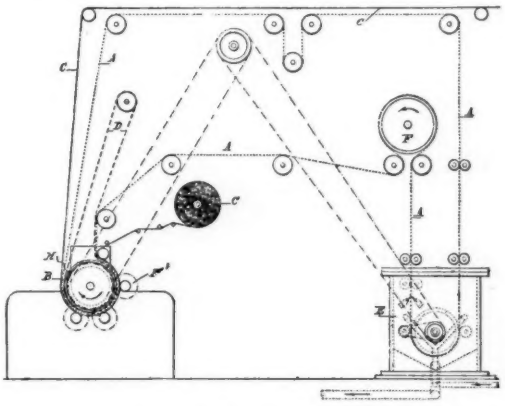


driven, while the other with the hanks upon it is driven by friction from the first said roller, and means to lead off the liquid squeezed out by the co-operating rollers from the hank, said means comprising a shallow trough adjustably mounted below the line of contact of the two rollers.

Process for Printing Upon Textile Fabrics

(1,639,218; August 16)

Eugene Ebersol, Mulhouse, France, assignor to Society Freres Koechlin, Mulhouse, Haut-Rhin, France.



In apparatus for printing textile fabrics, a pressure roller and an endless belt of metallic gauze between this pressure roller and the piece of fabric to be printed for absorbing the excess color.

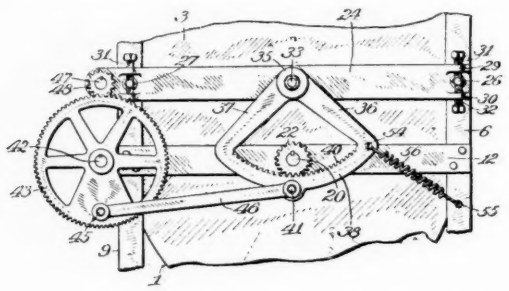
Power Washing Machine

(1,639,587; August 16)

Frank E. Bowers, Indianapolis, Ind.

A power gearing including a main frame bar to be horizontally secured in place, an adjustable frame bar

to be horizontally secured above the main frame bar having two vertical slots in proximity to the opposite ends respectively of the bar, the bar having also an ear above and an ear below each of the slots, two securing screws to be arranged in the slots respectively, two



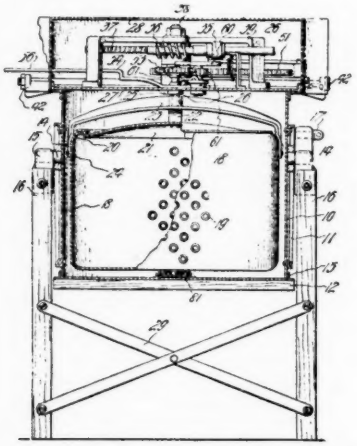
set-screws arranged in the upper ears to engage the securing screws respectively, two set-screws arranged in the lower ears to engage the securing screws respectively, a curved rack-bar having arms pivoted to the adjustable frame bar intermediately of said slots, a shaft rotatively supported by said main bar intermediately of its ends, a pinion secured to the shaft and being in engagement with the rack-bar, a gear wheel rotatably supported by said main bar adjacent to one end thereof and having a crank pin, and a rod connected to said crank pin and pivoted in said rack-bar.

Combined Laundry Washing Machine and Hydro-Extractor

(1,637,930; August 2)

Archie Dimatos and Gregory Dimitri Michal, Sydney, New South Wales, Australia.

In a laundry machine, a casing, a perforate bowl in said casing, means for imparting oscillatory or rotary movement to said bowl, a spindle at the upper extremity of the bowl, a lever pivotally connected with the



casing and rotatably receiving the spindle and operatively associated with said movement imparting means and means rotatably mounting the lower extremity of the bowl in the casing and permitting tilting movement of the bowl whereby either oscillatory or rotary movement may be imparted to said bowl.

Manufacture of Stable Derivatives of Vat Dyestuffs

(1,639,206; August 16)

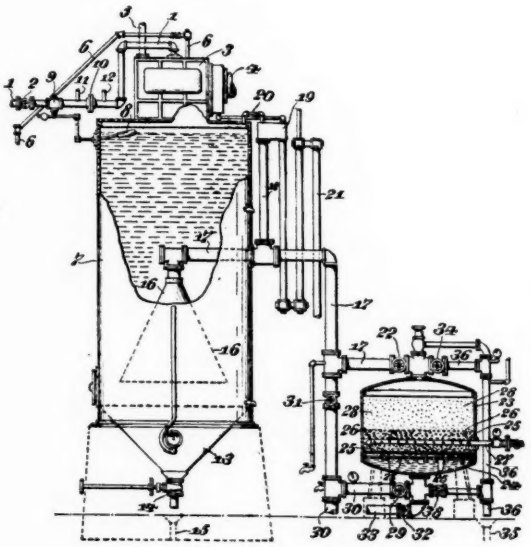
Arthur Wolfram, Hochst, Germany, assignor to the firm Durand & Huguenin S. A., Basel, Switzerland.

A process for the manufacture of stable derivatives of vat dyestuffs soluble in water, consisting in treating a leuco compound of a vat dyestuff with aminosulphonic acid in the presence of a tertiary organic base.

Water Treatment

(1,638,803; August 9)

George H. Gibson, Montclair, N. J., and Joseph D. Yoder, Philadelphia, Pa., assignors to Cochrane Corporation, Philadelphia, Pa., a corporation of Pennsylvania.



The method of treating water, which comprises subjecting the water to a reagent of such character and in such quantity as to produce a precipitate and to leave the water alkaline, and filtering the alkaline water through a medium comprising compound of calcium substantially insoluble in the alkaline water.

GERMAN WOOD DISTILLATION PLANT RAISES CAPITAL

According to a prospectus just published, an issue of 2,500,000 marks new common shares of Verein fuer chemische Industrie, Frankfort-on-the-Main, raising the common share capital to 6,500,000 marks, has been admitted to trading on the Frankfort exchange, ad-

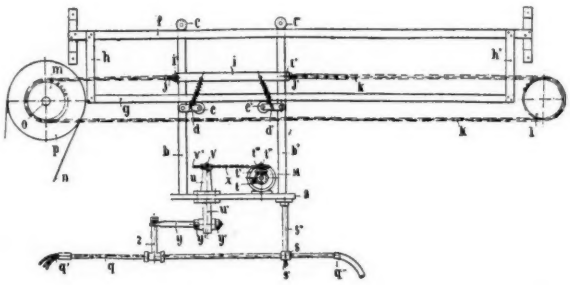
vises the Bureau of Foreign and Domestic Commerce. The "Verein," with Holzverkohlungindustrie, dominates the German wood distillation industry. The capital increase is reported to be for extension of production.

F. H. Lovenberg, formerly in charge of the St. Louis district sales territory of the Mathieson Alkali Works, Inc., has been assigned to the New England district sales office, located at Providence, R. I., to replace C. H. Clegg, who recently resigned.

Technical Notes from Foreign Sources

Spray Printing Fabric with the Aid of Stencils

The device shown in the accompanying illustration, which is patented in German Patent No. 440,007, differs from other apparatus used for the same purpose in the fact that the spray tube or nozzle is arranged on a carrier which moves back and forth over the table



over which the fabric passes. This spray nozzle can be moved transversely across the width of the fabric. This allows the printing of several colors on the fabric, while lies flat on the table, while various stencils are employed with the various colors.

The spraying arrangement consists of a movable carriage a which is supported on two vertical rods b and b' provided with rollers c and c' at their upper ends. These rods are tied together by the cross-rod i provided with tension bolts j and j' at its ends, to which an endless chain k is fastened. The gear wheel m fastened to the shaft o drives this chain. The spray tube shown at q is provided with nozzles q' and q", and these are fed from several dye liquor containers placed on the support a. The piece u is rotated by means of the chain x which passes over the gear wheels v and v' and t' and t", and this turns the nozzles.

Direct Production of Metallic Acetate Mordants on Fiber

The compounds of iron, chromium and aluminum are used as mordants and the acetates of these metals are employed mostly as mordants in printing practice. These metallic acetates can be prepared by different methods; for example, by double decomposition of the metallic sulphate with lead or calcium acetate. It is also possible to precipitate the metals from their salts in the form of hydroxides and then dissolve the latter in acetic acid. In either case the formation of the acetate involves difficulties and at times only the basic acetate is desired for the purpose of mordanting the fiber, inasmuch as only the basic salt will dissociate quickly on the fiber with the deposition of the corresponding metallic oxide. One method that has been devised of getting around these difficulties is to effect the formation of the metallic acetate right on the textile fiber during the drying process.

This process depends on the old principle of saturating strongly acid mineral salts with acetates, as is customary in many dyeing and printing operations, in order to prevent the fiber being injured by the strong mineral acid salts. For example, it has been proposed to use aniline acetate in the Aniline Black process in the place of aniline hydrochloride. This substitution, however, was found to be untenable, for the reason that the acetate did not react in the desired manner in the formation of the black.

While the actual idea of preparing heavy metal acetates from its metallic salts by neutralization with acetates of the alkalies and alkaline earths is old, nevertheless the application of this principle to the formation of metallic mordants directly on the textile fiber is new. It was found possible to do this after considerable experimentation, adjustment of the temperature, the degree of moisture, the duration of the action with ventilation, and in certain cases with short steaming. Thus, when all the conditions were satisfactory, the metallic hydrates were fixed on the fiber in exactly the same form in which they are prepared in the usual formation of steam colors on the textile material. It may be possible in a further development of this process to produce color prints on the fiber when the required salts are directly incorporated with the color paste for the purpose of double decomposition. (Bulletin Societe Industrielle de Rouen, through Der Textilchemiker und Colorist, 1927. p. 97.)

Afterchroming Neolan and Radio Dyes in Piece Dyeing

The piece dyer is confronted with difficulties in using afterchrome colors in dyeing hard woolen fabrics or closely woven woolens. Breaks or folds are often formed in the piece goods during this process that cannot be satisfactorily removed. It has been found that a great improvement is effected in the process

from this standpoint when from ½ to 1 per cent of a 30 per cent solution of acetic acid and 2 per cent of Protectol or 3 per cent of Egalisal are added to the chrome bath.

The Neolan colors are new members of the chrome group of colors which possess important properties; the Radio colors are not chrome colors, but belong to the class of dyestuffs employed in acid solutions.

It has been indicated that the way to dye Neolan colors is to prepare a liquor containing 1 per cent Tetracarnite, 5 to 10 per cent of sodium sulphate crystals and 12 to 15 per cent of a tartaric acid preparation, these substances being added to the old color liquor at a temperature of approximately 60 deg. Cent. Then the dye liquor is allowed to stand for ten minutes without introducing steam. Thereafter the dissolved dyestuff is added and the liquor is allowed to stand for another 10 minutes without steaming. The question is, just how uniformly will the dyestuff be absorbed from this liquor and the dyed piece show no spots?

There is, however, a disadvantageous condition. For when batches are brought up to the boiling point in about thirty minutes, strongly boiled for another hour and samples dyed in this liquor, it is found that the sample is very irregularly dyed. It was thought advisable to boil the liquor for another hour without adding any substance; then the goods were uniformly dyed throughout. It thus follows that the rate of absorption of the Neolan dyestuffs is quite slow. Although it is true that the dyestuff will be uniformly and rapidly absorbed by the fiber, it requires a certain amount of time before it penetrates the fabric entirely.

It is also possible to use Neolan colors in shading off, and various acid alizarine colors are used along with them for this purpose. These colors are added in small amounts to the Neolan liquor and rapid results are obtained. A little tartaric acid is always added to help fix the color on the fiber. It is not necessary to add as much sulphuric acid as is stated in the dyeing directions—namely, 10 per cent—in dyeing piece goods. If this is done and the goods are boiled for a long time, the fiber will be injured.

Neolan colors have been used on the rough-white carbonized goods with the addition of 3 per cent sulphuric acid and Leonil to the color liquor. The Radio dyestuffs are used on all goods which are not required to be carbonized or on woolens with rayon effects. If the latter goods must be dyed with Neolan colors, it is necessary to use formic acid in the place of sulphuric acid.

While the Neolan colors require the use of a comparatively large amount of acid to insure their complete fixation on the fiber, the Radio colors are dyed from a weakly acid liquor. These colors are satisfactorily dyed from a liquor which contains 5 to 10 per cent of Glauber salt and 4 per cent of ammonium acetate. The piece goods are allowed to remain in the liquor for a definite period at 60 deg. Cent. without adding steam; the liquor is brought up to the boiling point within a period of twenty minutes and allowed to boil quietly for a period of one hour before the fabric is sampled. When rayon is present in the piece goods, 2 per cent of formic acid is added. In other cases a corresponding amount of bisulphate is added. (Deutsche Faerber Zeitung, 1927, pp. 709-711.)

Dyeing Hosiery Containing Mixed Fibers

In nearly all cases hose will require some scouring before being dyed. Wool and wool mixtures are usually scoured with a good soap and a little mild alkali, such as ammonia or soda. In dyeing wool-cotton mixtures the type of dye vat or dyeing machine used is important, for it is necessary to control the temperature of the liquor within fairly narrow limits. Direct cotton colors will in many cases give a solid shade on the two fibers from a neutral bath if the temperature is carefully regulated. Violet and brown tones may show some variation and this may be corrected by the addition of a suitable neutral dyeing acid color to the same bath to tone the wool. The temperature is of great importance in dyeing these mixtures in all sorts of shades. Too long boiling often strips the color from the cotton and fixes it on the wool, which then becomes too heavy in shade.

Two-color effects are advised for the brightest and best results, the wool being first dyed with acid dyestuffs from a strong acid liquor, leaving the cotton clear, which is then dyed from a cold or lukewarm concentrated bath containing salt and the proper dyestuff.

In dyeing wool-rayon mixtures the same general method in dyeing cotton-wool mixtures is employed. In the case of plaited goods the treatment should be as short as possible to prevent wool fibers coming through the rayon surface giving it a hairy appearance.

In dyeing wool-silk mixtures, direct dyestuffs are best used with 5 to 20 per cent of Glauber salt, according to depth of shade. The hose is entered at 50 to 60 deg. Cent., then the liquor is raised to the boiling point and boiled gently for thirty to forty-five minutes. The steam is shut off and the hose is allowed to dye in the cooling bath. Some of the direct dyestuffs, particularly the blues, require the addition of a little acetic acid.

Cotton-silk mixtures must be dyed with dyestuffs which give uniform shades on both fibers. Direct colors are mostly used for this purpose, but even some of these will not give the same shade on the two fibers and the cotton will have to be shaded. This is accomplished with neutral dyeing acid colors which will dye the silk and not stain the cotton. It may be necessary toward the end of the operation, if the silk is not deep enough, to use a little acetic acid. In dyeing mode shades, colors must be chosen which dye at or near

the same temperature and give similar tones on the two fibers. Some dyers prefer to use colors which dye the cotton and leave the silk practically clear, and fill up the latter with acid colors which work in a neutral or alkaline bath and do not affect the cotton to any extent. (Journal of the Society of Dyers and Colorists, 1927, pages 249-251.)

COAL TAR FOR THE CANARY ISLANDS

A short time ago the Automobile Club of Teneriffe requested bids to be closed September 11, 1927, on 100 tons of coal tar. Local representatives of American firms offered prices to the local club, and also to the organization in Las Palmas, Grand Canary, which needs 100 tons. American prices are competitive with British, and it is felt that the sales will be made by American firms, according to a Department of Commerce dispatch from Consul R. A. Gibson, Teneriffe.

NEW PONSOL BROWN AND ACID RED ISSUED

An addition to the Ponsol series of vat dyes and a new acid red dyestuff have been announced by the dyestuff department of E. I. du Pont de Nemours & Co. The first is branded as Ponsol Brown AR Double Paste, described as a bright reddish brown of extremely good fastness to light, washing and chlorine. It is said to be suitable for dyeing on all types of machines, and, further, to be of special value for cotton piece dyers for dyeing fauns, tans, browns, olive drabs and similar shades. It changes shade very slightly in soaping, according to the description, and offers maximum obtainable fastness.

The new acid red is produced under the name of Pontacyl Light Red 4BL. It is described as exceptionally level dyeing and very fast to light, being particularly suitable for dyeing mode shades in combination with other fast-to-light acid colors or acid alizarine dyes. It is useful for producing taupes, grays, fauns, etc., on woolen goods requiring good light fastness, such as upholstery materials and fine dress goods.

As Pontacyl Red 4BL is described further as having excellent solubility, very level dyeing properties and good exhaust, it can be employed in machine dyeing and is suitable for yarns or piece goods. It can be used for printing carpet yarns as well as both wool and silk, and is said to be a good ground color for white discharge work on both fibers.

Alfred A. Mercier, who has been engaged for seven years in textile research with the U. S. Bureau of Standards, has joined the staff of the Cotton-Textile Institute, Inc., as research associate.

WASH-FAST SILKS IN GREATER VOGUE, SAYS SEMI-ANNUAL SILK REPORT

The production and sale of washable silks has been greatly increased during the past half year by the demand for this type of goods, says the mid-year report of the Silk Association of America in commenting on the current trends in silk buying. The mid-year report, issued last week, constitutes an authoritative survey of conditions in the silk manufacturing industry and an informative outline of the main features of the last season's silk market.

Deliveries of raw silk to American mills during the first half of 1927 broke all records, according to this report. Some of this extra silk has gone into longer silk stockings to go with the shorter dress, which has also been of silk, the most favored textile in the wardrobe, says the report. Another innovation of the past season in the silk industry was the transparent velvet made to meet the popular demand for sheerness in dress silks.

Great activity took place among silk manufacturers when they took advantage of the possibilities offered by a strong consumer demand. This was further encouraged, says the report, by the fact that raw silk had by the middle of the summer reached a level which was lower than the proportionate prices for raw wool, raw cotton and rayon. Inexpensive types of broad silks increased in demand; prints showed greater artistry in design; prices were close to the cost of production.

American-made silk was used this summer by the Navy Department for its parachutes, in place of the imported weave formerly used. Tests proved the special basket weave, developed with the encouragement of the Department of Commerce, superior to the imported weave.

A NEW STANDARD HOSIERY COLOR CARD ISSUED

The Textile Color Card Association, in co-operation with the National Hosiery and Underwear Manufacturers' Association, has just issued the second edition of the Standard Hosiery Color Card of America. Since issuing the first edition in 1925, the association has created and issued season hosiery colors, forecasting the fashionable shades for spring and fall.

In arranging the second edition the association had the assistance of the official Color Committee appointed in 1924 by the National Hosiery and Underwear Manufacturers' Association to standardize colors for the hosiery industry.

The new edition contains eighty-eight colors—portrayed in silk knitted tubular fabric. The original sixty-six standard colors on the first edition remain unchanged, and to these are added twenty-two colors, all but one of which have appeared on various season hosiery cards.

and through their popular acceptance have become sufficiently staple in character to entitle their incorporation in a standard card.

The standardization of colors has proved of great economic benefit to the hosiery industry. The element of uncertainty as to fashionable tendencies each season has been greatly reduced by having an authentic seasonal hosiery color card with a limited number of novelty shades —all of which have been chosen to harmonize with garments and shoes. The Textile Color Card Association has been the medium by which the shoe, hosiery and costume industries have been able to work out a constructive color program each season.

NEW AMERICAN ANILINE COLOR CARD ON WOOL DYES

A combined shade card and classified index of its wool colors has been issued by the American Aniline Products, Inc., of New York. The shade card section displays this manufacturer's well-known Amacid and Chromaven colors on woolen yarns. One highly useful feature is that the dyeings are preceded by several text pages giving information on the properties and application of each color shown. The classified data in this text, according to the announcement, are largely the result of actual dyehouse practice and the dyeings were made under practical conditions.

The data comprise "General Methods for Dyeing Amacid Colors," and group the individual colors on the basis of their fastness to light, washing, salt water, etc., and of their level dyeing properties, and, in addition, give a group of dyes for the coloring of solid shades on wool and silk unions. Then follows a list of selected dyes for the shading of wool or silk in neutral baths and a list of Amacid colors suitable for dyeing in iron machines and of those suitable for copper kettles. There is also a list by groups of colors reserving effect threads, showing which have the least staining effect on the various fibers when dyed in the proper manner.

The general methods for the application of chrome colors are dealt with, followed by a list of the Amacid dyes suitable for dyeing in the chrome methods and a list of the colors classified according to their fastness properties.

Information on the reserving of effect threads of silk, acetate silk, cotton and viscose rayon, on colors of excellent fastness to various metals, and on chrome colors possessing special properties of fastness and application comprises the remainder of the text of the card.

The book is neatly bound in black cloth, embossed in gold and fits into an outside protective cover. Distribution to the trade will be made through deliveries of the manufacturer's representatives.

NATIONAL PRODUCES NEW DIRECT BROWN

A Direct Brown for the production of tans, khakis and browns that may be used alone or in combinations has been announced by the National Aniline & Chemical Company. The new color is designated as National Erie Fast Brown G2R. Its properties are very similar to Erie Fast Brown GR, though it yields brighter and redder tones.

According to the description, this new Erie Brown has good fastness to storing and adaptability to dyeing in the presence of copper. It is said to possess good solubility and level dyeing properties. After-treatment with chrome or copper renders the shade somewhat duller, but increases its fastness to washing and light.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

EXPERIENCED CHEMIST

American chemist, B.Sc., with twelve years' analytical, research and manufacturing experience in the dyestuff industry seeks position where ability and loyalty will be recognized. References. Address Classified Box 418, American Dyestuff Reporter.

DYESTUFF SALESMAN

Dyestuff salesman, having covered New Jersey, State of New York and adjacent territory for many years, is desirous of connecting with first-class concern. Address Classified Box 421, American Dyestuff Reporter.

WANTED

Salesman to represent old-established concern manufacturing Hosiery and Skein Dyeing Machinery and Mercerizing Machinery. Selling experience is essential, as well as a good working knowledge of dyeing and ability to demonstrate machines in a practical manner. No application will be considered unless full information is given regarding age, education, experience, etc. Address Box 409, American Dyestuff Reporter.

SALESMEN WANTED

Manufacturer offers a splendid opportunity to one or two men who have successfully sold dyestuffs, chemicals and related specialties. Salary and commission. Men without experience need not apply. State full particulars. Address Classified Box 422, American Dyestuff Reporter.

WANTED

Chemist, thoroughly familiar with all branches of the lake industry. Address Classified Box 423, American Dyestuff Reporter.